AD-A162 911 INSTALLATION RESTORATION PROGRAM PHASE II CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN TX R W BAUER ET AL. OCT 85 RAD-85-212-027-21-03-VOL-2 1/6

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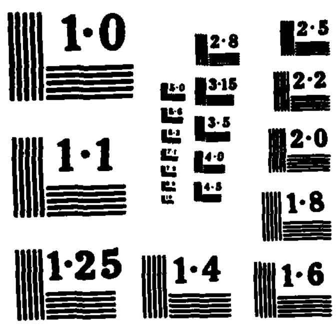

NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

DCN 85-212-027-21-03

Volume II

INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION
STAGE 2

APPENDICES

FOR

TINKER AFB, OKLAHOMA

AIR FORCE LOGISTICS COMMAND
WRIGHT-PATTERSON AFB, OHIO

OCTOBER, 1985

PREPARED BY

RADIAN CORPORATION
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CONTRACT NO. F33615-83-D-4001

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DR. DEE ANN SANDERS
TECHNICAL SERVICES DIVISION (TS)

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OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL)
BROOKS AIR FORCE BASE, TEXAS 78235

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APPENDIX A

Definitions, etc.

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APPENDIX A

Definitions, Nomenclatures and Units

- AFB - Air Force Base
- Aquifer - geologic unit capable of storing and transmitting significant quantities of water.
- DOD - Department of Defense
- EPA - Environmental Protection Agency
- GC - Gas Chromatography
- GC-MS - Gas Chromatography-Mass Spectrometry
- Indurated - rendered hard, as by heat, pressure or cementation
- IRP - Installation Restoration Program
- mg/l - milligrams per liter
- POL - Petroleum, oil and lubricants
- PVC - Polyvinyl Chloride
- RCRA - The Resource Conservation and Recovery Act
- RWDS - Radiological Waste Disposal Site
- µg/L - Micrograms per liter
- USAF - United States Air Force

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APPENDIX B

Scope of Work

INSTALLATION RESTORATION PROGRAM
PHASE II, STAGE 2 FIELD INVESTIGATION
TINKER AFB, OKLAHOMA

I. DESCRIPTION OF WORK

The purpose of this task is to determine if environmental contamination has resulted from solvent storage and waste disposal practices at Tinker AFB OK; to provide estimates of the magnitude, extent and direction of movement of contamination should contamination be found; to identify potential environmental consequences of migrating pollutants, and to identify future monitoring efforts required to document conditions at Tinker AFB.

Ambient air monitoring of hazardous and/or toxic material and Air Force personnel shall be accomplished when necessary, especially during drilling operations.

The presurvey report (mailed under separate cover) and Phase I IRP report (mailed under separate cover) incorporated background and description of the sites for this task. To accomplish this investigation, the contractor shall take the following actions:

A. General

1. All water samples collected shall be analyzed on site by the contractor for pH, temperature and specific conductance. Sampling, maximum holding time and preservation of samples shall strictly comply with the following references: <u>Standard Methods for The Examination of Water and Wastewater</u>, 15th Ed. (1980), pp. 35-42; <u>ASTM</u>, Part 31, pp. 76-86, (1980), Method D-3370; and <u>Methods for Chemical Analysis of Waters and Wastes</u>, EPA Manual 600/4-79-020, pp. xiii to xix (1979). Minimum detection limits and methods for analysis are shown in Attachment 1.

2. All wells installed during this effort shall be constructed of Schedule 40 PVC casing and screen. Each well shall be completed to ten feet below the level of the aquifer to be monitored, and ten feet of screen shall be set. Each well shall be provided with a surface grout seal, protective steel casing with locking cap and three guard posts placed radially away from the well.

a. Shallow wells shall be installed into the first water bearing zone encountered (average depth, 30 feet). Well casing and screen shall be 2" ID PVC; wells shall be installed using hollow-stem auger drilling techniques.

b. Deep wells shall be installed into the first significant saturated sandstone body encountered (average depth, 100 feet). Well casing and screen shall be 4" ID PVC; wells shall be installed using air-rotary drilling techniques.

c. Total footage of wells installed shall not exceed 1190 linear feet.

3. All contractor installed wells shall be developed, water levels measured and locations recorded on a project map and specific site maps.

* Changes are underscored.

4. Field data collected for each site shall be plotted and mapped. The nature, magnitude and potential for contaminant flow within each zone to receiving streams and groundwaters shall be estimated. Upon completion of the sampling and analysis, the data shall be tabulated in the next R&D Status report as specified in Item VI.

B. In addition to items delineated in A above, conduct the following specific actions at sites identified on Tinker AFB:

1. Buried Tanks and Pits (Bldg 3001)

a. Inventory past and present industrial operations to locate any buried storage tanks or pits within a quarter-mile radius around Bldg 3001. To perform the inventory, the contractor shall:

(1) review available Air Force records;

(2) interview appropriate Tinker Air Force Base personnel; and,

(3) conduct a detailed surface inspection tour. No tanks or pits shall be entered or sampled.

b. Provide the results of this inventory, with summary of findings and recommendations for future work, in the final report specified in Item VI.

2. Base Water Supply Wells

a. Measure depth to water in each available (27) base water supply wells, after a shutdown of 2-4 days for equilibration. Wells shall be shutdown and measured in blocks; the shutdown shall be coordinated with the contractor, but shall be performed by Tinker AFB personnel (included in Base Support, Item III).

b. Determine the elevation of the piezometric surface and the local direction(s) of groundwater flow in the regional aquifer based on the depth-to-water measurements. Provide the depth-to-water data in the next R&D status report as specified in Item VI.

c. Compile an inventory of all public and private wells in the vicinity of the eastern boundary of Tinker AFB based on data available from the State of Oklahoma. The contractor shall obtain these data from the state. Water pumping rates and static depth to water, where available, shall also be used in the calculation specified in I.B.2(b) above.

3. Landfill Six

a. Install three shallow and four deep monitor wells in the vicinity of Landfill Six. The shallow wells shall be installed along the northern boundary of the base (below toe of landfill); the deep wells shall be installed around the private well located north of the landfill (information on private well provided under separate cover).

b. Sample each well twice for Volatile Organic Halogens (14 analyses). Sample each well once for Volatile Organic Compounds (VOC) and Base/Neutrals and Acid Extractable (BNE) compounds (7 analyses each for VOC and BNE).

c. Collect and analyze one groundwater sample from monitor well #2A south of Landfill 6. The water sample shall be analyzed for purgeable Halocarbons using EPA Method 601. The contractor shall use the detection limits as specified by the method.

4. Radioactive Waste Disposal Sites

Conduct a geophysical investigation, using a magnetometer or equivalent technique to determine the exact location of the radioactive waste disposed at sites (RWDS) 1022E and 62598. Site RWDS 62598 contains a "lead still" made of sheet lead and is located south of Facility 1025 and north of Crutcho Creek (See Attachment 2). Site RWDS 1022E contains approximately 8-10 lead pigs containing low-level radioactive materials and is located adjacent to the northwest corner of Landfill No.3 south of West Crutcho Creek (See Attachment 2).

5. Building 3001

a. Install seven deep monitor wells in the vicinity of Bldg 3001 between the building and the eastern base boundary. Three wells shall be installed along East Drive; four wells shall be installed along Douglas Boulevard.

b. Sample each well twice for Volatile Organic Halogens (14 analyses). Sample each well once for VOC and BNE compounds (7 analyses each).

6. Stream Sediment Study

a. Collect stream sediment samples at 24 locations on Tinker AFB as shown in Attachment 2.

b. Analyze the sediment samples for the parameters shown in Attachment 3.

C. Set up and drilling at site Landfill Six shall not proceed until written authorization is forwarded to the contractor by the PCO or his/her representative. The reason for this is that appropriate Tinker AFB personnel are in the process of obtaining the required permit(s) to drill on this non Air Force Property.

D. Data Review

Results of sampling and analysis shall be tabulated and incorporated in the Informal Technical Information report (Sequence 3 Attachment 1, and Sequence 2 Attachment 3 as reflected in Item VI below) and forwarded to USAF OEHL/TS for review. Results shall also be forwarded as available in the next monthly R&D status report.

E. Reporting

1. A draft report delineating all findings of this field investigation shall be prepared and forwarded to the USAF OEHL as specified in Item VI below for Air Force review and comment. This report shall include a discussion of the regional hydrogeology; well logs of all project wells; data from water level surveys; water and stream sediment analysis results; well, pit and tank inventories; available geohydrologic cross sections; groundwater surface and gradient vector maps; and Laboratory quality assurance information. The report shall follow the USAF OEHL supplied format (mailed under separate cover).

2. Estimates shall be made of the magnitude, extent and direction of movement of contaminants discovered. Potential environmental consequences of discovered contamination, where known, must be identified.

3. Specific requirements, if any, for future groundwater and surface water monitoring must be identified.

F. Meetings

Two of the contractor's Senior personnel shall meet with Air Force and/or state, county or federal officials on two occasions for 16 hours each to present and discuss the results of this investigation. Meetings will be held at Tinker AFB, on dates to be established later.

II. SITE LOCATION AND DATES

Tinker AFB OK
USAF Clinic/SGB
Dates to be established

III. BASE SUPPORT: Tinker AFB will provide the following base support for these sites:

A. Buried Tanks and Pits

1. Provide relevant installation records and access to, or support of, reproduction services.

2. Schedule interviews with appropriate base personnel and provide escort for industrial areas.

B. Base Water Supply Wells

1. Schedule and execute 2-4 day shutdown of blocks of base water supply wells. This will incur minimal effect on base water supply.

2. Provide wellhead elevation data of each base water supply well. If data is not available, base will obtain such data by surveying.

C. Landfill 6

1. Provide required surveying to determine relative elevations of monitor wells.

2. Provide cuttings removal and drill site cleanup, including packaging when required.

D. Bldg 3001

1. Provide advance drill site clearance for selected locations.

2. Provide temporary construction barriers and parking/traffic control support for wells sited in parking lots and/or roadways.

3. Provide required surveying to determine relative elevations of monitor wells.

4. Provide cuttings removal and drill site cleanup, including packaging when required.

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT

1. Capt Robart Bauer
USAF OEHL/TS
Brooks AFB TX 78235
(512) 536-2158
AV 240-2158

2. Col Harry Russell
HQ AFLC/SGPB
Wright-Patterson AFB OH 45433
(513) 257-6210
AV 787-6210

3. Capt Darrel Cornell
USAF Hospital/SGB
Tinker AFB OK 73145
(405) 734-7844
AV 735-7844

VI. In addition to sequence numbers 1, 5 and 10 which are applicable to all orders, the reference numbers below are applicable to this order. Also shown are data applicable to this order.

Sequence No.	Block 10	Block 11	Block 12	Block 13	Block 14
Attachment 1					
4	ONE/R	84 NOV 05	84 NOV 19	85 FEB 18	*
3	ONE/T	**	**		2
Attachment 3					
2	ONE/T	**	**		2

*A minimum of two draft reports will be required. After incorporating Air Force comments concerning the first draft report, the contractor shall supply the USAF OEHL with a second draft report. The report shall be forwarded to the applicable regulatory agencies for their comments. Contractor shall supply the USAF OEHL with 25 copies of each draft report and 50 copies plus the original camera ready copy of the final report.

**Upon completion of analysis.

Attachment 1

Analytical Methods and Required Detection Limits
(For Water Unless Otherwise Shown)

Parameter	Method	Detection Limit
Arsenic	EPA 206.2 or 206.3	10 µg/L (1.0 µg/g, sediment)
Barium	EPA 208.2	200 µg/L (20 µg/g, sediment)
Cadmium	EPA 213.2	10 µg/L (1.0 µg/g, sediment)
Chromium	EPA 218.1	50 µg/L (5.0 µg/g, sediment)
Lead	EPA 239.2	20 µg/L (2.0 µg/g, sediment)
Mercury	EPA 245.1	1 µg/L (0.1 µg/g, sediment)
Selenium	EPA 270.3	10 µg/L (1.0 µg/g, sediment)
Silver	EPA 272.2	10 µg/L (1.0 µg/g, sediment)
Copper	EPA 220.1	20 µg/L (2.0 µg/g, sediment)
Zinc	EPA 289.1	50 µg/L (5.0 µg/g, sediment)
Maganese	EPA 243.1	50 µg/L (5.0 µg/g, sediment)
Nickel	EPA 249.1	100 µg/L (10 µg/g, sediment)
Fluoride	EPA 340.2	100 µg/L (10 µg/g, sediment)
Nitrate	EPA 353.2	100 µg/L (10 µg/g, sediment)
Cyanide	Standard 412	10 µg/L (1.0 µg/g, sediment)
Phenol	EPA 420.1	1 µg/L (1.0 µg/g, sediment)
PCBs	EPA 608	0.25 µg/L (1.0 µg/g, sediment)
Total Organic Carbon (TOC)	EPA 415.1	1000 µg/L (1000 µg/g, sediment)
Endrin	Standard 509A	0.02 µg/L (0.02 µg/g, sediment)
Lindane	Standard 509A	0.01 µg/L (0.01 µg/g, sediment)
Methoxychlor	Standard 509A	0.20 µg/L (0.20 µg/g, sediment)
Toxaphene	Standard 509A	1.00 µg/L (1.00 µg/g, sediment)
2,4-D	Standard 509B	0.06 µg/L (0.06 µg/g, sediment)
2,4,5-TP Silvex	Standard 509B	0.06 µg/L (0.06 µg/g, sediment)
Volatile Organic Halogens	EPA 601	*
Volatile Organic Compounds (VOC)	EPA 624	**
Base/Neutrals and Acid Extractable Compounds (BNE)	EPA 625	**

*Detection limits for Volatile Organic Halogens shall be as specified for the compounds by EPA Method 601. Method: Federal Register, Vol. 44, No. 233, pp. 69468-69473. This method should be strictly followed including these items:

Item 1.4 - This method is recommended by EPA for use only by experienced residue analysts or under the close supervision of such qualified persons.

Item 2.2 - This is most important. If interferences are encountered (as in early peaks such as vinyl chloride), the method provides a secondary gas chromotographic column that will be helpful in resolving the compounds of interest from interferences. This must be done in the case of vinyl chloride and so noted in analysis report.

Items 3.3, 7.1-7.3 - These sections on interferences, contamination and QC should be strictly followed.

Item 8.3 - All samples must be analyzed within the recommended holding times. This must be followed without exception.

If questions are encountered about certain contaminants, you may be asked to show both chromatograms used to rule out possible interferences.

**Detection limits for VOC and BNE compounds shall be as specified for the compounds by EPA Methods 624 and 625 respectively.

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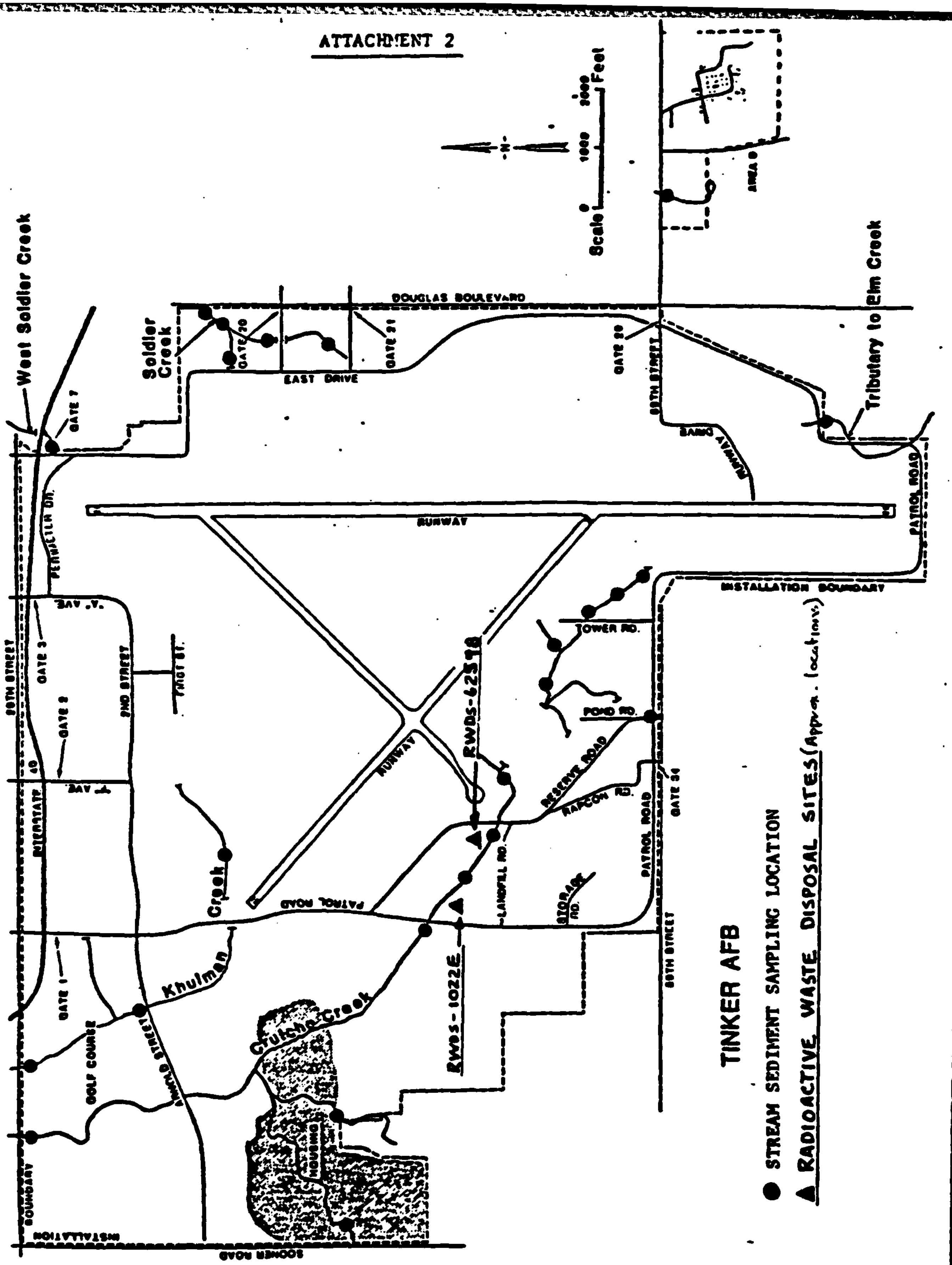
ATTACHMENT 2



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Attachment 3

Analytic Parameters by Site

Parameter	LF 6	Bldg 3001	QA	Total
	Number of Samples			
Volatile Organic Halogens	14	14	3	31*
Volatile Organic Compounds (VOC)	7	7	2	16
Base/Neutrals and Acid Extractable Compounds (BNE)	7	7	2	16

	Stream Sediment	QA	Total
Arsenic	24	3	27
Barium	24	3	27
Cadmium	24	3	27
Chromium	24	3	27
Lead	24	3	27
Mercury	24	3	27
Selenium	24	3	27
Silver	24	3	27
Copper	24	3	27
Zinc	24	3	27
Maganese	24	3	27
Nickel	24	3	27
Fluoride	24	3	27
Nitrate	24	3	27
Cyanide	24	3	27
Phenol	24	3	27
PCB's	24	3	27
Total Organic Carbon (TOC)	24	3	27
Endrin	24	3	27
Lindane	24	3	27
Methoxychlor	24	3	27
Toxaphene	24	3	27
2,4-D	24	3	27
2,4,5-TP Silvex	24	3	27

*Since each sample for Volatile Organic Halogens shall be analyzed twice (see method footnote item 2.2 in Atch 1), the contractor shall price 62 analyses by EPA method 601

APPENDIX C

Well Numbering System

The wells drilled for the Tinker Air Force Base Installation Restoration Program, Phase II Stage 2, were designated by Zone Number and sequential letters within zones. This nomenclature is an extension of that used in the Stage 1 investigation. Designators were assigned in the order in which the drilling locations were established. Zone 6 applies to the Building 3001 Investigation. Zone 7 applies to the Landfill 7 investigation. Table C-1 contains a list of all wells and cores for the project, listed by zone of investigation.

TABLE C-1. LIST OF WELLS

Building 3001 Area		
	Well 6A	Well 6E
	6B	6F
	6C	6G
	6D	
Landfill 6		
	Well 7A	Well 7E (not completed)
	7B	7F
	7C	7G
	7D	

APPENDIX D

Well Logs

This Appendix contains the logs of drilling and well completion activities for the project. Table C-1 (Appendix C) containes a list of all wells and cores for the project, listed by zone of investigation.

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Logs of Drilling Operations

Lithologic Symbols Utilized

- Massive sandstone, fine-grained
- Sandstone beds with shale partings
- Shale with sandstone lenses
- Shale
- Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
- Gravel

C1212

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Sheet 1 of 3

Log of Drilling Operations

Boring or Well No. 6A
Location East Drive, north of Bradley Drive
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 26 June 1984 and end 26 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		None	grab from cuttings	Gravelly clay fill.	
				CLAY, red-brown.	
5				CLAY, dark brown, damp, becoming drier with depth, completely dry by 6'.	
10				SAND, red, fine, dry.	
15					
20				SHALE, red-brown, sandy, friable.	Very hard drilling minor water at 22', dry below, continuous drilling.
25					
30					
35					
40				SAND, red-brown, fine.	

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RADIAN CORPORATION

Sheet 2 of 3

Log of Drilling Operations

Boring or Well No. 6A
Location East Drive, north of Bradley Drive
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 26 June 1984 and end 26 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40					
45				SAND, brown, fine.	
				SHALE, brown, grey mottle, dry.	
50					
55					
60				SAND, red-brown, fine, dry.	
65				GRAVEL, red-brown, fine, silt, Sand, water returns.	
70					
75					
80					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6A

Location East Drive, north of Bradley Drive

Log Recorded By

Project Tinker AFB IRP Phase II Stage 2

Beginning 26 June 1984 and end 26 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80					
				Same materials. TD = 82'.	
85					
90					
95					
100					
105					
110					
115					
120					

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RADIAN CORPORATION

Sheet 1 of 3

Log of Drilling Operations

Boring or Well No. 6B
Location East Drive, south of Bradley Drive
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 27 June 1984 and end 27 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		None	grab from cuttings	CLAY, brown, plastic (fill).	
				CLAY, red-brown.	
5					
				CLAY, brown.	
10				CLAY, grey-brown, plastic.	
15				CLAY, red-brown, sandy, dry.	
				CLAY, mixed red-brown and brown-black, plastic, damp, minor sand.	
20					
				CLAY, brown, sandy.	
25					
30					
35					
				SAND, red-brown, fine, silty, dry.	
40					

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RADIAN CORPORATION

Sheet 2 of 3

Log of Drilling Operations

Boring or Well No. 6B
Location East Drive, south of Bradley Drive
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 27 June 1984 and end 27 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40					Thin clay layers 40-42'.
				SANDY CLAY, red-brown.	
45					
50					
55				SAND, red-brown, fine, little clay.	
				Same, lighter color.	
60					
65				Same, damp.	
70					
75				Same, moist.	Driller reports beginning of water production.
80					

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RADIAN
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Sheet 3 of 3

Log of Drilling Operations

Boring or Well No. 6B
Location East Drive, south of Bradley Drive
Log Recorded By

Project Tinker AFB IRP Phase II Stage 2
Beginning 27 June 1984 and end 27 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80					
85					
90				Same materials. TD = 90'.	
95					
100					
105					
110					
115					
120					

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RADIAN CORPORATION

Sheet 1 of 3

Log of Drilling Operations

Boring or Well No. 6C
Location East Drive at Entry Road A
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 27 June 1984 and end 28 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	CLAY, brown, with gravel (fill).	
5				CLAY, dark brown, sandy.	
				SANDSTONE, light brown, hard, dry.	
				SANDY CLAY, red-brown, increasing sand with depth.	
10					
				SAND, red-brown, some clay.	
15					
20				CLAY, red-brown, moist, friable, some sand, drier with depth.	Minor water at ~20', dry below, continuous drilling.
25					
30				SAND, red-brown, fine, dry.	
35					
40					

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RADIAN CORPORATION

Sheet 2 of 3

Log of Drilling Operations

Boring or Well No. 6C
Location East Drive at Entry Road A
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 27 June 1984 and end 28 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				No discharge.	
45					
50				SAND, red-brown, fine, some clay.	
55				SAND, red-brown, fine.	
60				No change.	Shale streak at 63'.
65					
70					Begin water production.
75				SAND, red-brown, fine, silt, some water.	Scant returns.
80					

7-83-13718

RADIAN CORPORATION

Sheet 3 of 3

Log of Drilling Operations

Boring or Well No. 6C

Location East Drive at Entry Road A

Log Recorded By

Project Tinker AFB IRP Phase II Stage 2

Beginning 27 June 1984 and end 28 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80				SAND, red-brown, medium.	
85				SANDSTONE, red-brown, friable.	Hard drilling.
90				TD = 90'.	
95					
100					
105					
110					
115					
120					

7-83-13718

RADIAN CORPORATION

Sheet 1 of 2

Log of Drilling Operations

Boring or Well No. 6D
Location Douglas Blvd. north of Bradley Drive
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 19 June 1984 and end 19 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	CLAY, dark red-brown, with gravel (fill).	
5				CLAY, red-brown, minor sand.	
				SHALE, weathered, red-brown, friable, minor sand.	
10					
15				SHALE, red-brown.	
20				SAND, fine, red-brown.	
25					
30					
35				SAND, fine, red-brown, thin clay layers.	Harder drilling.
40					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6D

Location Douglas Blvd. north of Bradley Drive

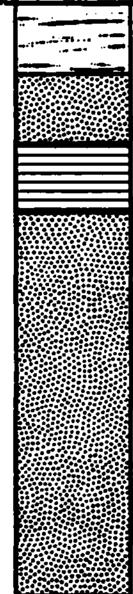
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2

Beginning 19 June 1984 and end 19 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.



Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				SAND, fine, red-brown, fines.	Begin water production.
45				SHALE, red-brown.	Reduced water production.
				SAND, medium, fine gravel, fines.	Water production ~1 gpm or less.
50					
55				Same materials. TD = 57'.	
60					
65					
70					
75					
80					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6E
Location Douglas Blvd. & Entry Road A
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 19 June 1984 and end 19 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	CLAY, red-brown, sandy, with mixed gravel (fill). Same, no gravel.	
5					
10				SHALE, weathered, red-gray, minor sand, changing to red-brown with depth.	
15				SHALE, sandy, red-brown, friable, increasing sand with depth. SAND, fine, friable red-brown, minor fines.	
20					
25				SHALE, red-brown.	
30					
35				SAND, fine, friable, red-brown, minor fines. SHALE, red-brown, with grey mottling.	
40					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6E

Location Douglas Blvd. & Entry Road A

Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2

Beginning 19 June 1984 and end 19 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				SAND, fine, tan/pink, clean.	
				SAND, fine, red-brown.	
45					
50					
55					
60					Scant returns 60-70'; add ∿80 gals. water to clean hole, lift cuttings.
65					
70				SAND, medium, red-brown, with fine gravel and fines.	
75					
80					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6E

Location Douglas Blvd. & Entry Road A

Log Recorded By

Project Tinker AFB IRP Phase II Stage 2

Beginning 19 June 1984 and end 19 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80				Same materials, more indurated.	Harder drilling, driller reports minor water.
85					
90					
95					
100				Same materials.	Scant returns, water in hole when change rods.
105					
110					Water production ~1 gpm.
115				Same materials. TD = 115'.	Water production 3-5 gpm.
120					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6F

Location DPDO Yard

Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2

Beginning 20 June 1984 and end 20 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	SHALE, weathered, red-brown.	
5				SHALE, grey. SHALE, red-brown.	
				SAND, fine, red-brown, minor silt.	
10				SHALE, pink, turning red-brown with depth, very dry.	Hard drilling, high dust.
15					
20					
				SAND, fine, pink/tan.	
25					
				SANDY SHALE, red-brown, some thin hard streaks.	
30					
35					
40					

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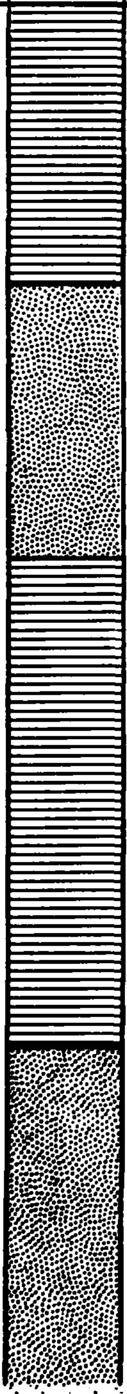
RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6F
Location DPDO Yard
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 20 June 1984 and end 20 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.



Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40					
45					
				SAND, medium, red-brown.	
50					
				SAND, medium, red-brown, with fine gravel.	
				SAND, fine, tan/yellow.	
55				SAND, fine, brown, with shale pebbles. SANDSTONE, grey, hard. SHALE, red-brown.	
60					
65					
70				SAND, fine, red-brown.	
75					
80					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6F

Location DPDO Yard

Log Recorded By

Project Tinker AFB IRP Phase II Stage 2

Beginning 20 June 1984 and end 20 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80					
85					
90					
95				SAND, fine, red-brown, soft.	Sand collapse, add water to clean hole.
				SANDSTONE, hard.	Scant returns.
100				Same materials. TD = 102'.	
105					
110					
115					
120					

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RADIAN CORPORATION

Sheet 1 of 3

Log of Drilling Operations

Boring or Well No. 6G

Location West of Bldg. 3117

Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2

Beginning ______ and end ______ of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	SANDY CLAY, brown (heavily weathered shale).	
5					
				SHALE, red-brown.	
10					
				SAND, fine, red-brown, minor silt.	
15					
20				SILTY SAND, red-brown, partially wetted from up-hole poor returns.	Mud on bit, minor water, dry below, continue drilling.
25					
30					
35					
40					

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 6G
Location West of Bldg. 3117
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning ______ and end ______ of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				No change.	
45					
				Shale streak.	Hard drilling.
50					
				Shale streak.	Hard drilling.
55				Shale streak.	Hard drilling.
60					
				SANDY CLAY, red-brown, damp.	
65					
				Shale streak.	Hard drilling.
70					
75					
				SAND, red-brown, fine scant returns.	
80					

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RADIAN CORPORATION

Sheet 3 of 3

Log of Drilling Operations

Boring or Well No. 6G
Location West of Bldg. 3117
Log Recorded By

Project Tinker AFB IRP Phase II Stage 2
Beginning and end of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80					
85				Shale streak.	Hard drilling. Begin water production.
90				Same materials. TD = 90'.	
95					
100					
105					
110					
115					
120					

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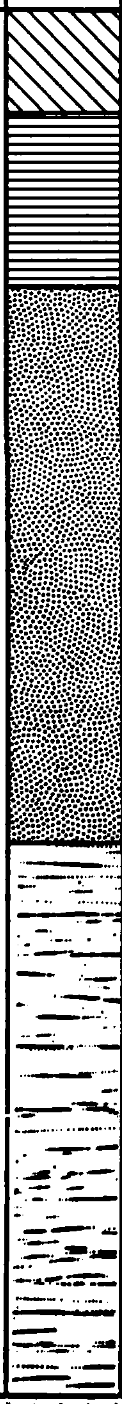
RADIAN CORPORATION

Sheet 1 of 3

Log of Drilling Operations

Boring or Well No. 7A
Location Adjacent (north) of SE 59th St.
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2
Beginning 11 July 1984 and end 11 July 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.



Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	CLAY-FILL, dark brown-red, organic fragments, silty sand; grades to sandstone.	Soil probably represents highway fill. Drilling performed with 7-7/8" diameter tricone bit.
				SHALE, red-brown, plastic, weathered appearance.	
5					
				SANDSTONE, fine-grained, red-orange, friable.	Cuttings damp at 11'; minor water produced to 20'.
10					
15					
20					Much water blown from hole at 22'.
25				SANDSTONE/SHALE (gradational contact with above sandstone), interbedded red-orange sandstone and shale, saturated.	
30					
35					Rig vibrates at 35'.
40					

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RADIAN
CORPORATION

Sheet 2 of 3

Log of Drilling Operations

Boring or Well No. 7A
Location Adjacent (north) of SE 59th St.
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2
Beginning 11 July 1984 and end 11 July 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40					No water produced at 42' after adding drill rod.
45					
50					Harder and slower drilling at 47'; increasing water production below 49'.
55				SANDSTONE, fine-medium grained, orange, friable, slightly moist.	Easy drilling below 55'.
60					Hole caved slightly at 62'.
65					
70				Sandstone is dry.	
75					
80					

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RADIAN CORPORATION

Sheet 3 of 3

Log of Drilling Operations

Boring or Well No. 7A
Location Adjacent (north) of SE 59th St.
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2
Beginning 11 July 1984 and end 11 July 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80–110				SANDSTONE with few mottled shale fragments, trace gravel.	Few cuttings returned below 84'.
					Water produced at 88'; dry at 93'.
					Poor cuttings return.
110				End of boring-110'.	Rig vibrates at 108-109'.

Depth scale: 80, 85, 90, 95, 100, 105, 110, 115, 120

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RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 7B

Location North of SE 59th St.

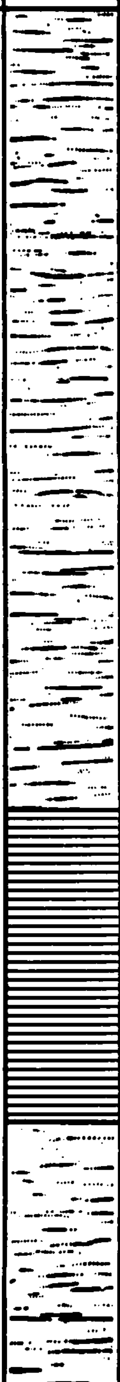
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2

Beginning 10 July 1984 and end 11 July 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.



Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	SAND, red-brown, some clay and organic fragments.	Drilling performed with 7-7/8" diameter tricone bit.
				SANDSTONE, fine to medium grained, red-brown, friable, slightly moist, lenses and layers of SHALE, red-brown, mottled, plastic.	
5					
10					
15					
20					
				SHALE, red-brown, moist, plastic; with thin sand laminae. Shale is interbedded with fine-grained, orange sandstone.	
25					
30					
				SANDSTONE, fine to medium grained, red-brown, friable.	Driller notes damp conditions, few cuttings returned to surface.
35				Moist; interbedded with SHALE, red-brown, mottled, plastic.	Few cuttings returned to surface.
40					

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RADIAN
CORPORATION

Sheet 2 of 2

Log of Drilling Operations

Boring or Well No. 7B
Location North of SE 59th St.
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2
Beginning 10 July 1984 and end 11 July 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40					Drilling suspended; much water blown from hole.
45				End of boring - 45'.	
50					
55					
60					
65					
70					
75					
80					

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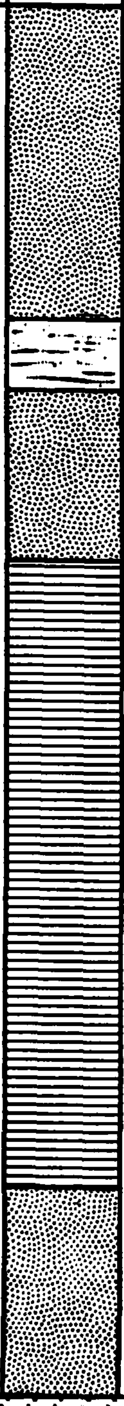
RADIAN CORPORATION

Sheet 1 of 3

Log of Drilling Operations

Boring or Well No. 7C
Location North of SE 59th St.
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2
Beginning 10 July 1984 and end 10 July 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.



Depth (ft)	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0	none	grab from cuttings	SANDSTONE, fine-medium grained, red-brown, friable, uniform texture, dry. Grades to orange-red color below 3'. Thin sandy soil (less than 1') at surface.	Drilling performed with 7-7/8" diameter tricone bit.
5				
10			Thin layers/lenses of SHALE, red, plastic; between 9-11'.	
15			Indurated sandstone, white at 15'. SHALE, red-brown, plastic, slightly moist, few lenses or layers of fine-med. grained sandstone (indurated zone at 18').	Harder drilling at 15', 18'.
20				
25				
30				
35			SANDSTONE, fine-medium grained, slightly indurated, slightly moist.	Rig vibrates at 34'.
40				

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RADIAN CORPORATION

Sheet 2 of 3

Log of Drilling Operations

Boring or Well No. 7C
Location North of SE 59th St.
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2
Beginning 10 July 1984 and end 10 July 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				Increasing moisture at 42', few cuttings returned.	
45					
50				Decreasing moisture, increasing silt content, few thin shale layers.	
55				Sandstone is orange, no silt, friable.	
60				SHALE, red-brown, plastic, slightly moist; some sandstone lenses and layers in shale matrix.	
65					
70				SANDSTONE, fine to medium grained, trace shale fragments, red-brown.	
75				Few cuttings returned to surface.	Rig vibrates at 77'.
80					

RADIAN CORPORATION

Log of Drilling Operations

Boring or Well No. 7C
Location North of SE 59th. St.
Log Recorded By L.N. French

Project Tinker AFB IRP Phase II Stage 2
Beginning 10 July 1984 and end 10 July 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
80					
85				Sandstone mixed with shale fragments.	
90					Rig vibrates at 88'. Water blown from hole after pause in drilling; drilling to 102' yielded very few cuttings.
95					
100				End of boring - 102'.	
105					
110					
115					
120					

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RADIAN CORPORATION

Sheet 1 of 2

Log of Drilling Operations

Boring or Well No. 7D

Location West edge of Landfill 6

Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2

Beginning 28 June 1984 and end 28 June 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250 Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	Clay-loam soil, brown.	
				Sandy clay, red-brown.	
5					
				Shale, red-brown, weathered.	
10					
				Shale, red-brown, slight to no weathering.	
15					
				Sand, red-brown, fine, some silt.	
20					
				Sand, red/tan, fine, becoming red-brown by 24'.	
25					
30					
35					
40				No change.	

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RADIAN CORPORATION

Sheet 2 of 2

Log of Drilling Operations

Boring or Well No. 7D
Location West edge of Landfill 6
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 28 June 1984 and end 28 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				No change.	
45				Shale streak.	Hard drilling, 4".
50				Same materials, slight moisture.	
55				Shale streak. Sandy clay, red-brown, moist.	Hard drilling, 2".
60				No change.	Little water production.
65					
70					
75				Same materials. TD - 75'.	
80					

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RADIAN CORPORATION

Sheet 1 of 2

Log of Drilling Operations

Boring or Well No. 7E

Location North edge of Landfill 6

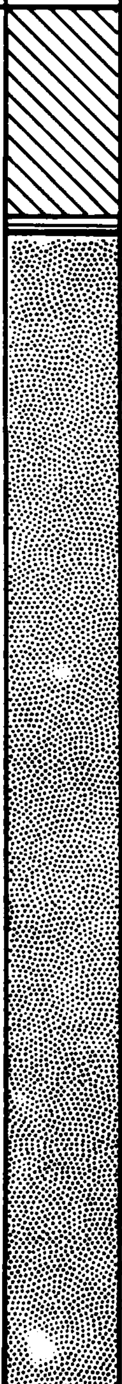
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2

Beginning 21 June 1984 and end ______ of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.



Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	Clay, red-brown, plastic.	
5				Clay, grey, sandy.	
			SS	Clay, red, mottled w/grey, firm, sandy.	Spoon refusal at 6'.
			grab from cuttings	Shale, weathered, red-brown.	
				Sand, fine, red-brown, damp.	
10					
15				Sand, red-brown, fine, many fines.	
20					Negative Draeger hydrocarbon, poly-test..
25					
30				Sand, red-brown, sandstone granules, damp.	
35					Harder drilling.
40					

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RADIAN CORPORATION

Sheet 2 of 2

Log of Drilling Operations

Boring or Well No. 7E
Location North edge of Landfill 6
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 21 June 1984 and end
of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40					
45					
50					
55				Sand, red-brown, fine, becoming darker with depth.	
60				Same materials. TD = 60', no water encountered.	Hole dry 6/22/84. Abandon by grouting.
65					
70					
75					
80					

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RADIAN CORPORATION

Sheet 1 of 1

Log of Drilling Operations

Boring or Well No. 7F
Location North edge of Landfill 6
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 22 June 1984 and end 22 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	Sand, red-brown, fine, silty.	
				Sand, red-brown, fine, less silt.	
5					
10					
15				Sand, brown, damp.	
20				Clay, brown, sandy.	Mud on bit at 20', 22 gals. water in hole when resume drilling.
				Same materials. TD = 25'.	Small water production.
25					
30					
35					
40					

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RADIAN CORPORATION

Sheet 1 of 1

Log of Drilling Operations

Boring or Well No. 7G
Location East edge of Landfill 6
Log Recorded By W.M. Little

Project Tinker AFB IRP Phase II Stage 2
Beginning 21 June 1984 and end 21 June 1984 of drilling operation
Sampling Interval (Estimated) variable (ft)
Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
0		none	grab from cuttings	Clay-loam soil, dark brown, damp.	
5					
					Negative Draeger hydrocarbon.
10				Sand, red-brown, fine, silty, damp.	
				Sand, red-brown, fine, damp.	
15					
20				Clay, brown, moist.	
				Gravel, fine, silty and sandy.	Heavy water production.
25					
				Same materials. TD = 30'.	
30					
35					
40					

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RADIAN CORPORATION

Well Completion Logs

TABLE D-1. SPECIFICATION SHEET FOR GRAVEL PACK USED

Screen	Typical Grading Average	Typical Grading Range	Effective Size (mm) Average	Effective Size (mm) Range	Uniformity Coefficient
6	0%	0	1.25	1.18-1.30	1.53
8	3.7%	2.1-5.1			
10	22.9%	18.0-25.6			
12	51.4%	45.6-62.3			
14	72.8%	66.5-79.0			
16	94.6%	89.9-99.4			
20	98.4%	96.0-99.9			
25	98.6%	96.5-99.9			

RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 6A

Project Tinker AFB IRP Phase II Stage 2

Location East Drive, north of Bradley Drive

Log Recorded By W.M. Little

Construction started 26 June 1984 completed 26 June 1984

Development started 26 June 1984 completed 26 June 1984

Total depth drilled (ft) 82 feet.

Hole diameter 8 inch

Drilling method air rotary

Problems encountered during drilling None

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable

Storage method(s) plastic bags, ambient temperature

Casing type Schedule 40 PVC, flush joint Diameter 4 inches

Depth of casing (ft) 72 feet

Screen type Schedule 40, PVC, mill slot Diameter 4 inches

Slot size 0.020 inches Screen interval (ft-ft) 72-82 feet

Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand

Amount of gravel pack used see next page

Grain size distribution of gravel pack see specification sheet

Lithology of gravel pack Quartz, trace rock fragments

Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 62-82 feet

Interval of bentonite seal (ft-ft) 60-62 feet

Interval of grouting (ft-ft) 0-60 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

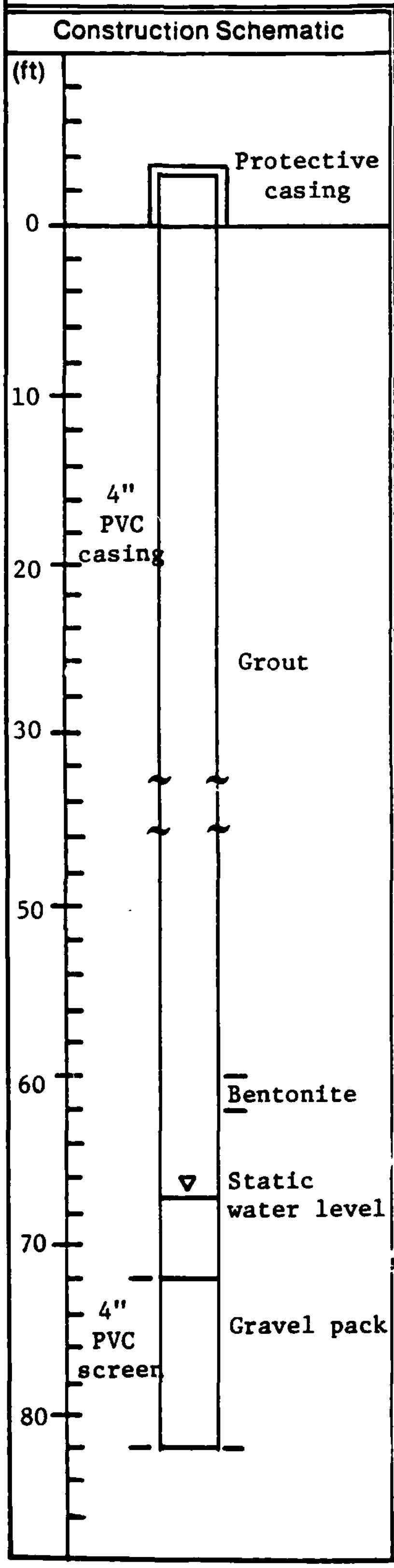
Boring or Well No. 6A

Project Tinker AFB IRP Phase II Stage 2

Location East Drive, north of Bradley Drive

Log Recorded By W.M. Little

Construction Schematic



Static level of water before approx. 67 feet (ft) and after 65 feet (ft) development

Development started 1700 hrs, 26 June 1984

Development ended 1755 hrs, 26 June 1984

Quantity of water discharged during development 30 gallons

Type, size/capacity of pump or bailer used for development Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 82 feet (ft)

After development 82 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
1700	Red, heavy silt	None	Silt	--	--	Slowly clearing apprx. 1/2 gpm.
1730	Begin surging 1-minute cycles, heavy silt with each new cycle, slowly clearing.					
1750	Resume continuous discharge, slowly clearing, greater flow (>1/2 gpm).					
1755	Cease developing.					

RADIAN
CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 6B
Project Tinker AFB IRP Phase II Stage 2
Location East Dr., South of Bradley Drive
Log Recorded By W.M. Little

Construction started 27 June 1984 completed 27 June 1984
Development started 27 June 1984 completed 27 June 1984

Total depth drilled (ft) 90 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling None

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 40 PVC, flush joint Diameter 4 inches
Depth of casing (ft) 80 feet
Screen type Schedule 40, PVC, mill slot Diameter 4 inches
Slot size 0.020 inches Screen interval (ft-ft) 80-90 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 75-90 feet
Interval of bentonite seal (ft-ft) 70-75 feet
Interval of grouting (ft-ft) 0-70 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213
Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

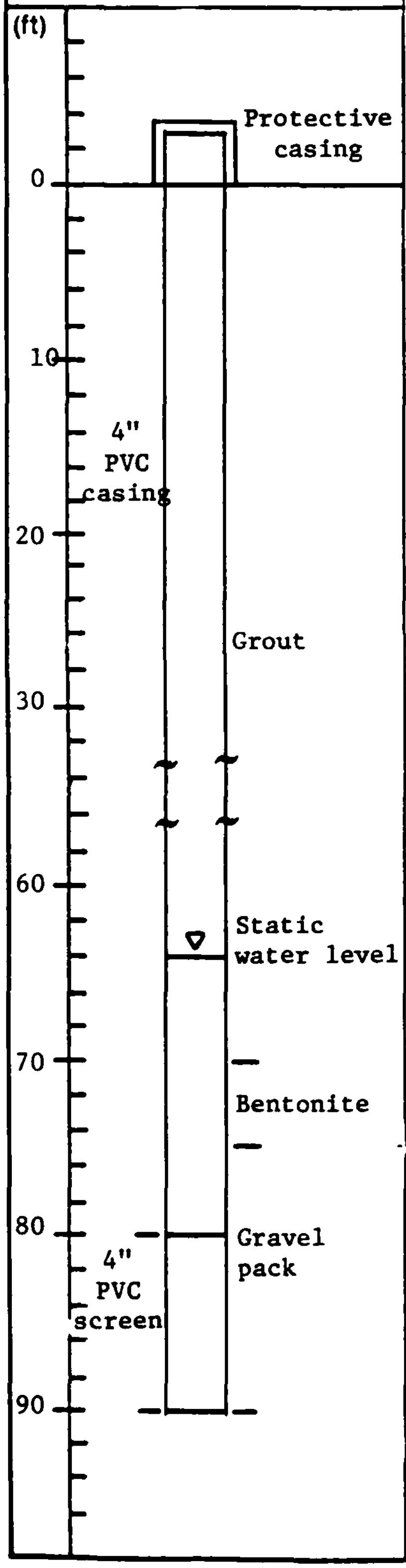
Boring or Well No. 6B

Project Tinker AFB IRP Phase II Stage 2

Location East Drive south of Bradley Drive

Log Recorded By W.M. Little

Construction Schematic



Static level of water before 64 feet (ft) and after 64 feet (ft) development

Development started 1315 hrs. 27 July 1984

Development ended 1415 hrs. 27 July 1984

Quantity of water discharged during development 20 gallons

Type, size/capacity of pump or bailer used for development

Depth of open hole inside well

Before development 90 feet (ft)

After development 90 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conduc-tivity	Remarks
1315	Red, heavy silt	None	Silt, minor fine sand	--	--	Very low flow, begin surging, slowly clearing.
1415	Red, mod-erate turbidity	None	Silt, chg	--	--	

RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 6C
Project Tinker AFB IRP Phase II Stage 2
Location East Drive at Entry Road A
Log Recorded By W.M. Little

Construction started 27 June 1984 completed 28 June 1984
Development started 28 June 1984 completed 28 June 1984

Total depth drilled (ft) 90 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling none

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 40 PVC, flush joint Diameter 4 inches
Depth of casing (ft) 80 feet
Screen type Schedule 40, PVC, mill slot Diameter 4 inches
Slot size 0.020 inches Screen interval (ft-ft) 80-90 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 61-90 feet
Interval of bentonite seal (ft-ft) 57-61 feet
Interval of grouting (ft-ft) 0-57 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

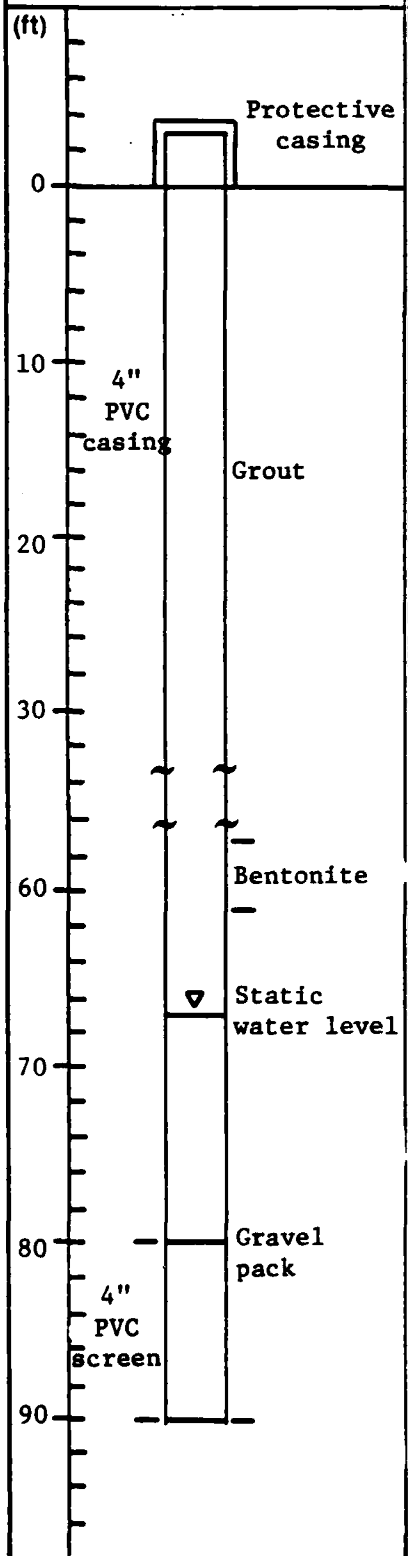
Boring or Well No. 6C

Project Tinker AFB IRP Phase II Stage 2

Location East Drive at Entry Road A

Log Recorded By W.M. Little

Construction Schematic



Static level of water before approx. 67 feet (ft) and after 67.5 feet (ft) development

Development started 1050 hrs, 28 June 1984

Development ended 1300 hrs, 28 June 1984

Quantity of water discharged during development 20 gallons

Type, size/capacity of pump or bailer used for development

Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 90 feet (ft)

After development 90 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
1050	Red, heavy silt	None	Silt	--	--	Very low flow
1150	Red, moderate silt	None	Silt	--	--	Slowly elevating
	Shut down to allow recovery.					
1300	Blow approx. 10 gallons from hole, slowly clearing.					

RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 6D
Project Tinker AFB IRP Phase II Stage 2
Location Douglas Blvd, north of Bradley Dr.
Log Recorded By W.M. Little

Construction started 19 June 1984 completed 20 June 1984
Development started 20 June 1984 completed 20 June 1984

Total depth drilled (ft) 57 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling none

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 80 PVC, flush joint Diameter 4 inches
Depth of casing (ft) 47 feet
Screen type Schedule 40, PVC, mill slot Diameter 4 inches
Slot size 0.020 inches Screen interval (ft-ft) 47-57 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 41-57 feet
Interval of bentonite seal (ft-ft) 39-41 feet
Interval of grouting (ft-ft) 0-39 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213
Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

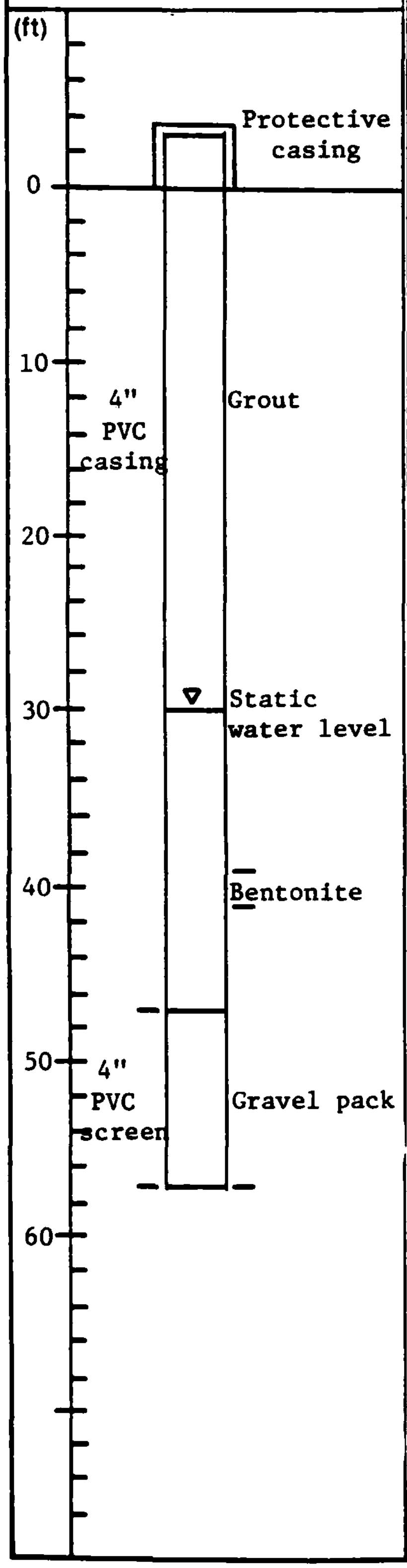
Boring or Well No. 6D

Project Tinker AFB IRP Phase II Stage 2

Location Douglas Blvd, north of Bradley Drive

Log Recorded By W.M. Little

Construction Schematic



Static level of water before 30 feet (ft) and after 30 feet (ft) development

Development started 0855 hrs, 20 June 1984

Development ended 0935 hrs, 20 June 1984

Quantity of water discharged during development 35 gallons

Type, size/capacity of pump or bailer used for development

Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 57 feet (ft)

After development 57 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conduc-tivity	Remarks
0855	Red, heavy silt	None	Silt, minor fine sand	--	--	<1 gpm flow
0915	Slowly clearing, begin surging, 1 minute cycles					~1/2 gpm
0935	Red, moderate silt	None	Silt	--	--	

RADIAN
CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 6E
Project Tinker AFB IRP Phase II Stage 2
Location Douglas Blvd. at Entry Road A
Log Recorded By W.M. Little

Construction started 19 June 1984 completed 19 June 1984
Development started 19 June 1984 completed 20 June 1984

Total depth drilled (ft) 115 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling none

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 80 PVC, flush joint Diameter 4 inches
Depth of casing (ft) 105 feet
Screen type Schedule 40, PVC, mill slot Diameter 4 inches
Slot size 0.020 inches Screen interval (ft-ft) 105-115 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 99-115 feet
Interval of bentonite seal (ft-ft) 97-99 feet
Interval of grouting (ft-ft) 0-97 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

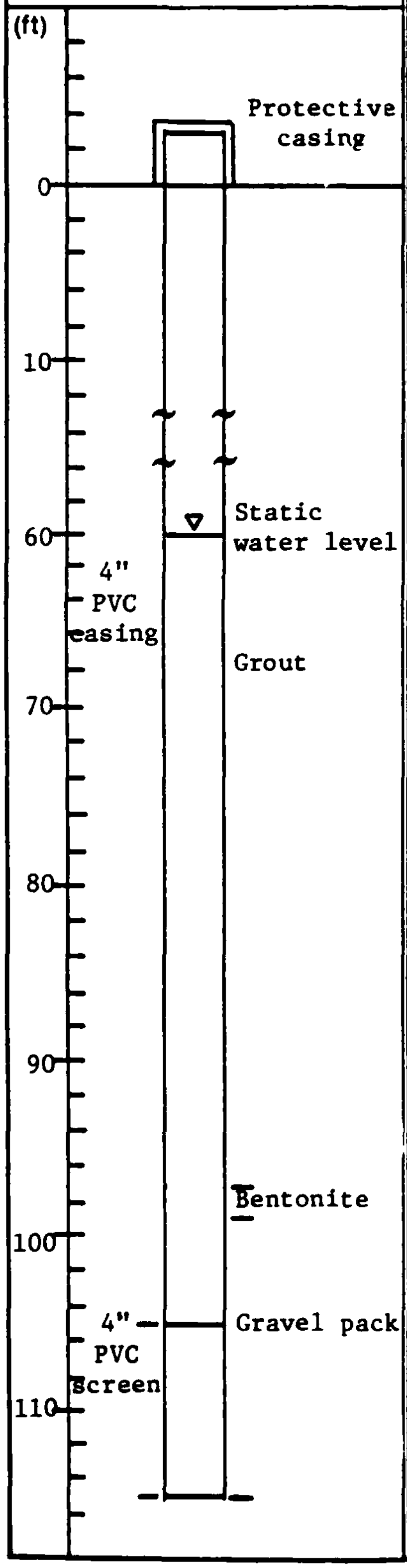
Boring or Well No. 6E

Project Tinker AFB IRP Phase II Stage 2

Location Douglas Blvd and Entry Road A.

Log Recorded By W.M. Little

Construction Schematic



Static level of water before 60 feet (ft) and after 60 feet (ft) development

Development started 1455 hrs, 19 June 1984

Development ended 1615 hrs, 20 June 1984

Quantity of water discharged during development 50 gallons

Type, size/capacity of pump or bailer used for development

Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 115 feet (ft)

After development 115 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
19 June 1455	Red, heavy silt	None	Silt	--	--	Low production
1530	Over pressure disturbs sandpack, cease developing.					
20 June 1535	Red, heavy silt	None	Silt	--	--	Slowly cleaning ~1/2 gpm
1615	Moderate silt	None	Silt			

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RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 6F

Project Tinker AFB IRP Phase II Stage 2

Location DPDO Yard

Log Recorded By W.M. Little

Construction started 20 June 1984 completed 21 June 1984

Development started 21 June 1984 completed 21 June 1984

Total depth drilled (ft) 102 feet

Hole diameter 8 inch

Drilling method air rotary

Problems encountered during drilling Sand collapse at approx 100 feet traps bit, some difficulty withdrawing.

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable

Storage method(s) plastic bags, ambient temperature

Casing type Schedule 80 PVC, flush joint Diameter 4 inches

Depth of casing (ft) 92 feet

Screen type Schedule 40, PVC, mill slot Diameter 4 inches

Slot size 0.020 inches Screen interval (ft-ft) 92-102 feet

Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand

Amount of gravel pack used see next page

Grain size distribution of gravel pack see specification sheet

Lithology of gravel pack Quartz, trace rock fragments

Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 89-102 feet

Interval of bentonite seal (ft-ft) 86-89 feet

Interval of grouting (ft-ft) 0-86 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

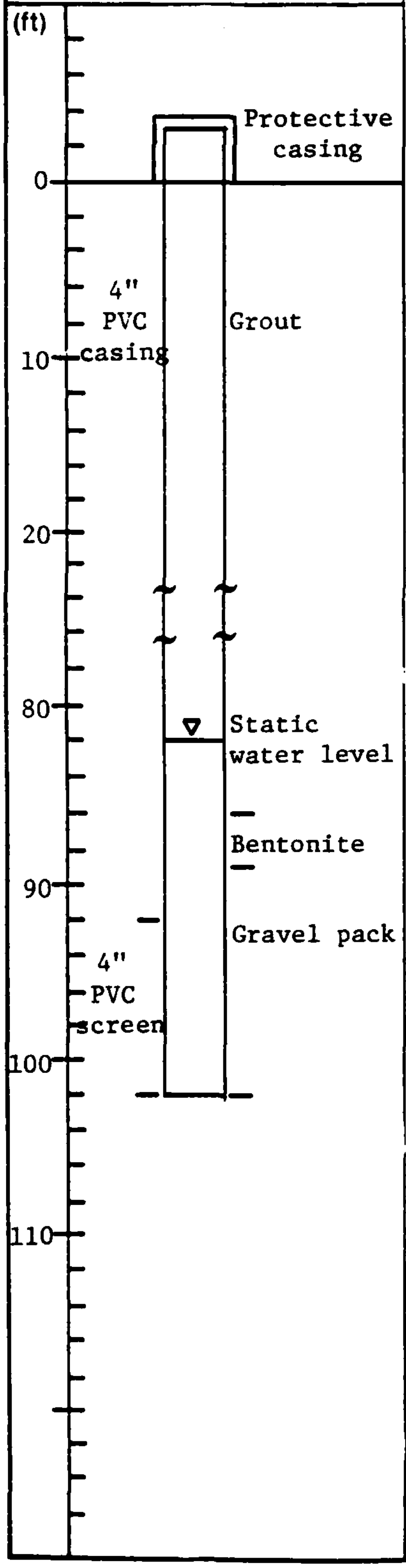
Boring or Well No. 6F

Project Tinker AFB IRP Phase II Stage 2

Location DPDO Yard

Log Recorded By W.M. Little

Construction Schematic



Static level of water before 82 feet (ft) and after 82 feet (ft) development

Development started 0900 hrs, 21 June 1984

Development ended 0940 hrs, 21 June 1984

Quantity of water discharged during development 20 gallons

Type, size/capacity of pump or bailer used for development
Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 102 feet (ft)

After development 102 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
0900	Red, heavy silt	None	Silt, minor fine sand	--	--	∿1/4 gpm
0910	Begin surging in 1 minute cycles					Slowly clearing
0940	Moderate silt	None	Silt	--	--	

RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 6G
Project Tinker AFB IRP Phase II Stage 2
Location West of Building 3117
Log Recorded By W.M. Little

Construction started 29 June 1984 completed 29 June 1984
Development started 30 June 1984 completed 30 June 1984

Total depth drilled (ft) 90 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling Minor cascading water from approx. 25 feet inhibits cuttings.
Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 80 PVC, flush joint Diameter 4 inches
Depth of casing (ft) 80 feet
Screen type Schedule 40, PVC, mill slot Diameter 4 inches
Slot size 0.020 inches Screen interval (ft-ft) 80-90 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 76-90 feet
Interval of bentonite seal (ft-ft) 73-76 feet
Interval of grouting (ft-ft) 0-73 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

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RADIAN CORPORATION

Well Completion Log: Sheet 2/2

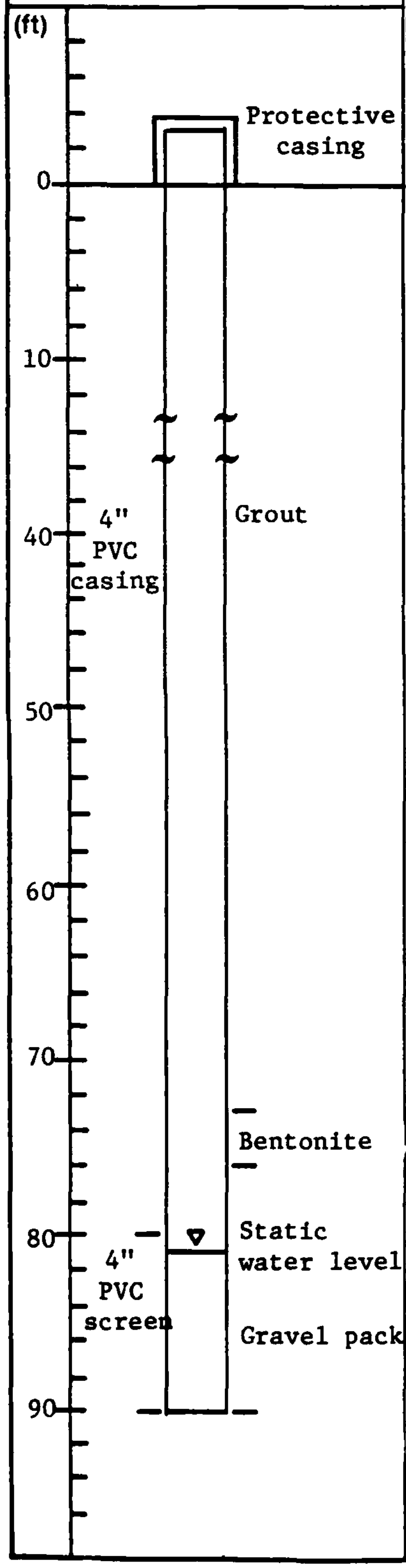
Boring or Well No. 6G

Project Tinker AFB IRP Phase II Stage 2

Location West of Building 3117

Log Recorded By L.N. French

Construction Schematic



Static level of water before 63 feet (ft) and after 81 feet (ft) development

Development started 0730 hrs, 30 June 1984

Development ended 0810 hrs, 30 June 1984

Quantity of water discharged during development 35 gallons

Type, size/capacity of pump or bailer used for development

Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 90 feet (ft)

After development 90 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
0730	Red, very heavy silt	None	Silt, fine sand	--	--	Very low flow.
	Flush casing to remove material inside, resume development.					
0740	Begin surging, low flow, slowly clearing.					
0805	Moderate silt	None	Silt, minor fine sand	--	--	
0810	No change, cease developing.					

RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 7A
Project Tinker AFB IRP Phase II Stage 2
Location 30 ft. north of SE 59th St., 75 ft. east of unnamed tributary of Soldier Creek
Log Recorded By L.N. French

Construction started 11 July 1984 completed 12 July 1984
Development started 12 July 1984 completed 12 July 1984

Total depth drilled (ft) 110 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling None

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 40 PVC, flush joint Diameter 4 inches
Depth of casing (ft) 97 feet
Screen type Schedule 40, PVC, mill slot Diameter 4 inches
Slot size 0.020 inches Screen interval (ft-ft) 97-107 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 78-107 feet
Interval of bentonite seal (ft-ft) 77-78 feet
Interval of grouting (ft-ft) 0-77 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

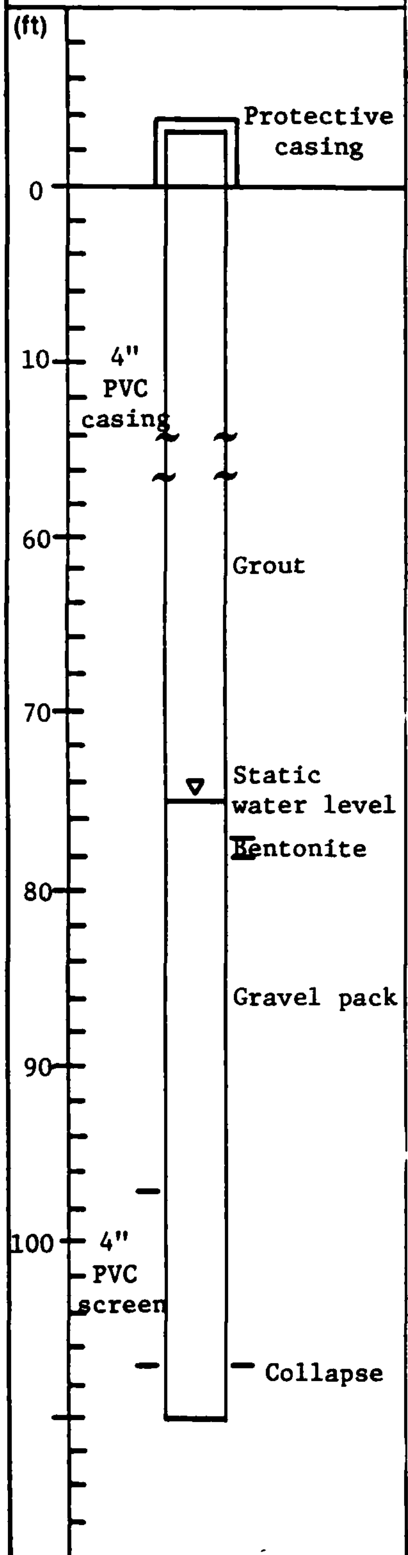
Boring or Well No. 7A

Location See Sheet 1

Project Tinker AFB IRP Phase II Stage 2

Log Recorded By L.N. French

Construction Schematic



Static level of water before 75.25' below land surface (ft) and after ______ (ft) development ______

Development started 12 July 1984

Development ended 12 July 1984

Quantity of water discharged during development 200 gallons

Type, size/capacity of pump or bailer used for development ______
Air lift (drilling rig) with variable discharge

Depth of open hole inside well ______

Before development ______ (ft)

After development ______ (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
7:30a	Turbid, red-brown	None	Silt, trace very fine sand	--	--	Start development; sustained rate of 1 gpm
8:15a	Turbid, red-brown	None	Little silt, no sand	--	--	--
9:30a	Cloudy, light red	None	Trace silt	--	--	Stop development

RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 7B

Project Tinker AFB IRP Phase II Stage 2

Location 200 ft. north of SE 59th St., 200 ft. west of unnamed tributary of Soldier Creek

Log Recorded By L.N. French

Construction started 11 July 1984 completed 11 July 1984

Development started 11 July 1984 completed 11 July 1984

Total depth drilled (ft) 45 feet

Hole diameter 8 inch

Drilling method air rotary

Problems encountered during drilling none

Water source for drilling and completion procedures no water used

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable

Storage method(s) plastic bags, ambient temperature

Casing type Schedule 40 PVC, flush joint Diameter 4 inches

Depth of casing (ft) 35 feet

Screen type Schedule 40, PVC, mill slot Diameter 4 inches

Slot size 0.020 inches Screen interval (ft-ft) 35-45 feet

Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand

Amount of gravel pack used see next page

Grain size distribution of gravel pack see specification sheet

Lithology of gravel pack Quartz, trace rock fragments

Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 30-45 feet

Interval of bentonite seal (ft-ft) 29-30 feet

Interval of grouting (ft-ft) 0-29 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

5-81-3570

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

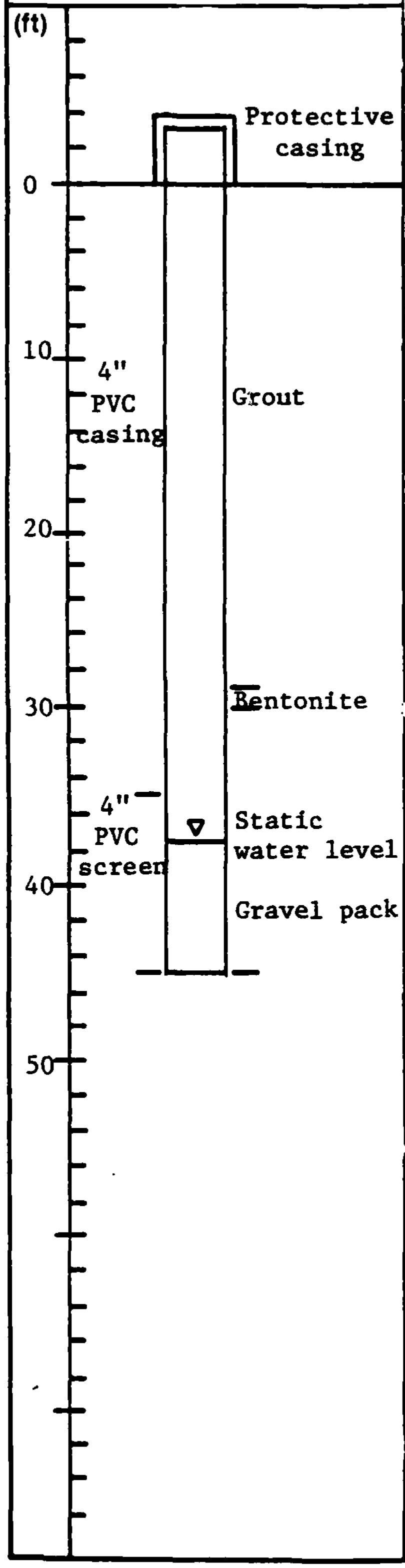
Boring or Well No. 7B

Project Tinker AFB IRP Phase II Stage 2

Location see sheet 1

Log Recorded By L.N. French

Construction Schematic



Static level of water before 37.5' below land surface (ft) and after 39.8 feet bls (ft) development

Development started 11 July 1984

Development ended 11 July 1984

Quantity of water discharged during development 20 gallons (est.)

Type, size/capacity of pump or bailer used for development
Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development (ft)

After development (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
9:00a	Turbid, red-brown	None	Silt	--	--	Start development (0.5 gpm continuous)
9:20a	Cloudy, red-brown	None	Silt	--	--	Sharp decrease in pumping rate; pause in pumping to allow for water-level recovery
10:30a	Cloudy	None	Some silt	--	--	Continued decrease in discharge; stop development.

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RADIAN CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 7C

Project Tinker AFB IRP Phase II Stage 2

Location 375' north of SE 59th St., 75' west of unnamed tributary of Solider Creek

Log Recorded By L.N. French

Construction started 10 July 1984 completed 10 July 1984

Development started 10 July 1984 completed 10 July 1984

Total depth drilled (ft) 102 feet

Hole diameter 8 inch

Drilling method air rotary

Problems encountered during drilling None

Water source for drilling and completion procedures no water used

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable

Storage method(s) plastic bags, ambient temperature

Casing type Schedule 40 PVC, flush joint Diameter 4 inches

Depth of casing (ft) 88 feet (below land surface)

Screen type Schedule 40, PVC, mill slot Diameter 4 inches

Slot size 0.020 inches Screen interval (ft-ft) 88-98 feet.

Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand

Amount of gravel pack used see next page

Grain size distribution of gravel pack see specification sheet

Lithology of gravel pack Quartz, trace rock fragments

Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 74.5-98 feet

Interval of bentonite seal (ft-ft) 73-74.5 feet

Interval of grouting (ft-ft) 0-73 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

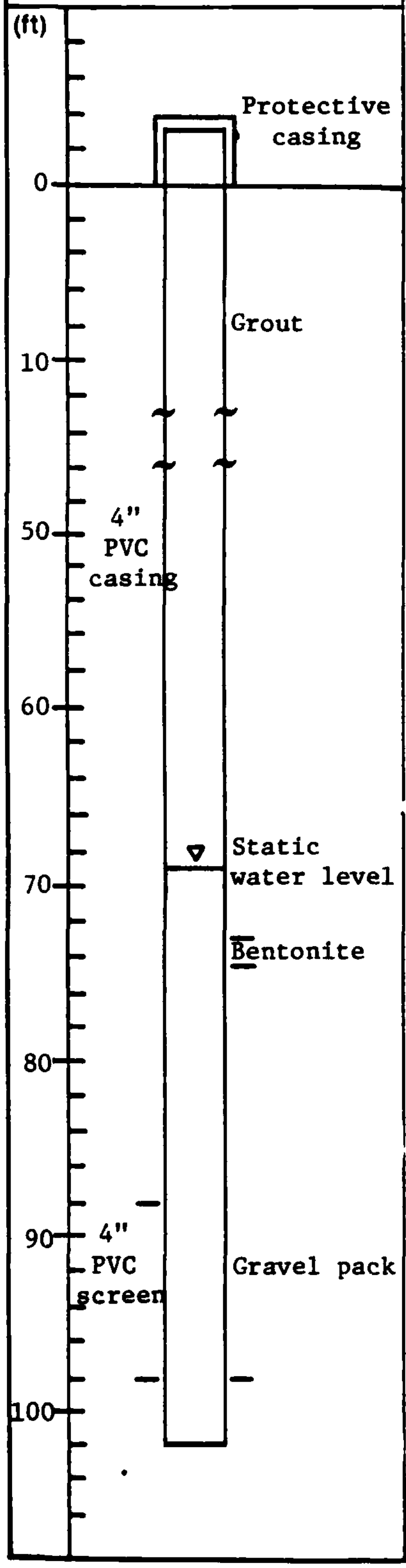
RADIAN CORPORATION

Well Completion Log: Sheet 2/2

Boring or Well No. 7C   Project Tinker AFB IRP Phase II Stage 2

Location see sheet 1   Log Recorded By L.N. French

Construction Schematic



Static level of water before approx. 73' below land surface (ft) and after 68.9 (ft) development

Development started 10 July 1984

Development ended 10 July 1984

Quantity of water discharged during development est. 90 gallons

Type, size/capacity of pump or bailer used for development

Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development ______ (ft)

After development ______ (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
1:00p	Turbid, red-brown	None	Silt, trace fine sand	--	--	Start development
2:15p	Turbid-cloudy, light-brown-red	None	Silt	--	--	
3:00p	Slightly cloudy, light red	None	Trace silt, no sand	--	--	Stop development

RADIAN
CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 7D
Project Tinker AFB IRP Phase II Stage 2
Location West edge of Landfill 6
Log Recorded By W.M. Little

Construction started 28 June 1984 completed 29 June 1984
Development started 29 June 1984 completed 29 June 1984

Total depth drilled (ft) 75 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling none

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 40 PVC, flush joint Diameter 4 inches
Depth of casing (ft) 65 feet
Screen type Schedule 40, PVC, mill slot Diameter 4 inches
Slot size 0.020 inches Screen interval (ft-ft) 65-75 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 64-75 feet
Interval of bentonite seal (ft-ft) 60-64 feet
Interval of grouting (ft-ft) 0-60 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

5-81-3579

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

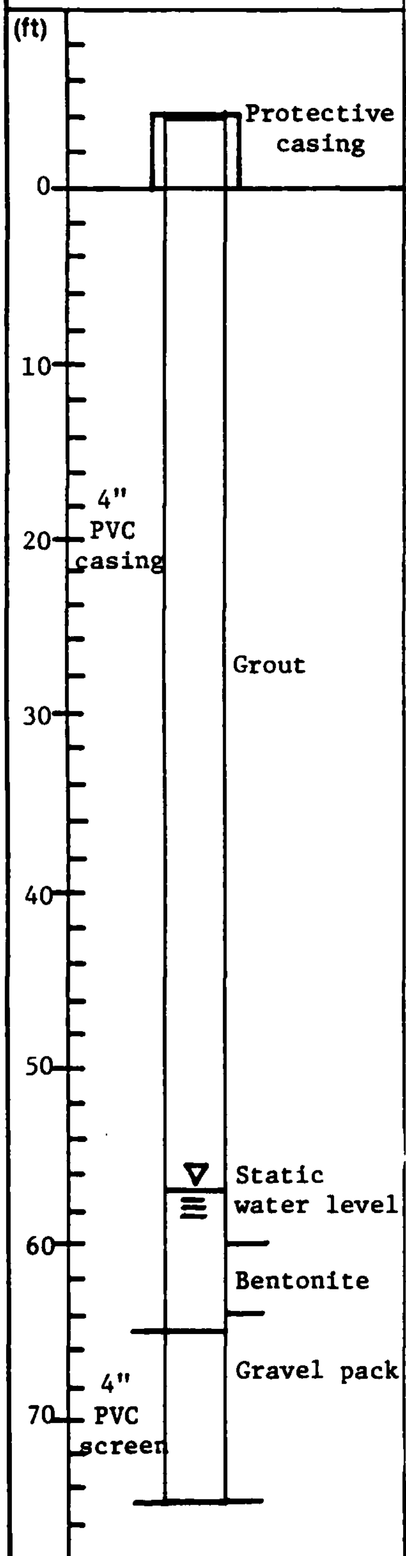
Boring or Well No. 7D

Project Tinker AFB IRP Phase II Stage 2

Location West of Landfill 6

Log Recorded By W.M. Little

Construction Schematic



Static level of water before 57 feet (ft) and after 57 feet (ft) development

Development started 0935 hrs, 29 June 1984

Development ended 1035 hrs, 29 June 1984

Quantity of water discharged during development 35 gallons

Type, size/capacity of pump or bailer used for development

Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 75 feet (ft)

After development 75 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
0935	Red, moderate silt	None	Silt	--	--	Production apprx. 1 gpm
0955	Moderate silt	None	Silt	--	--	Production slows to <1/2 gpm
	Slowly clearing, begin surging					
1035	Moderate silt; cease development.					

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RADIAN
CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 7F
Project Tinker AFB IRP Phase II Stage 2
Location North edge of Landfill 6
Log Recorded By W.M. Little

Construction started 22 June 1984 completed 22 June 1984
Development started 22 June 1984 completed 22 June 1984

Total depth drilled (ft) 25 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule PVC, flush joint Diameter 2 inches
Depth of casing (ft)
Screen type Schedule 40, PVC, mill slot Diameter 2 inches
Slot size 0.020 inches Screen interval (ft-ft) 15-25 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 12-25 feet
Interval of bentonite seal (ft-ft) 10-12 feet
Interval of grouting (ft-ft) 0-10 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213
Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

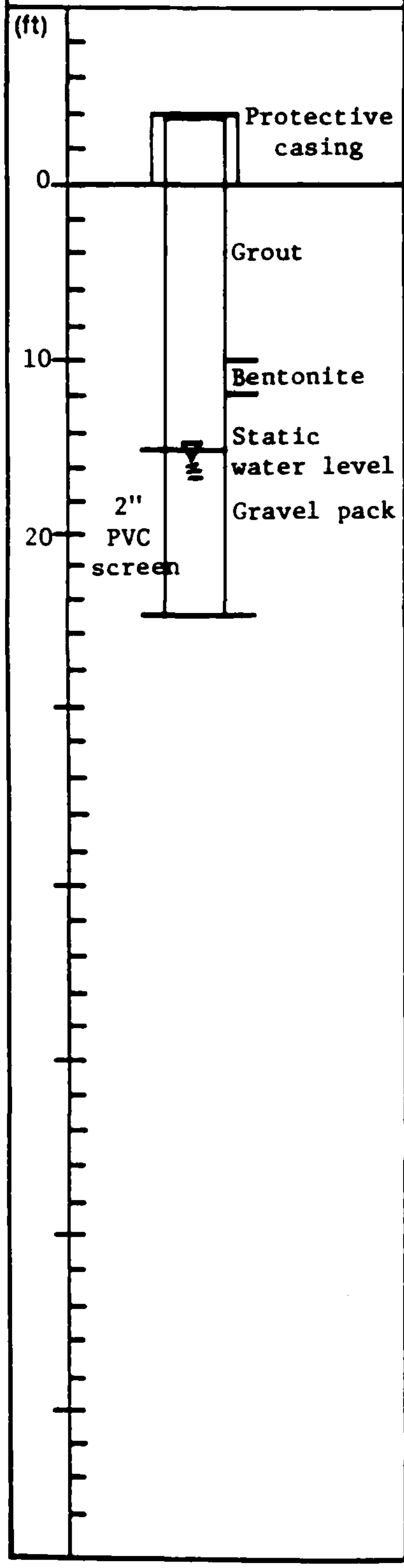
Boring or Well No. 7F

Project Tinker AFB IRP Phase II Stage 2

Location North edge of Landfill 6

Log Recorded By W.M. Little

Construction Schematic



Static level of water before 16 feet (ft) and after 16 feet (ft) development

Development started 1012 hrs, 22 June 1984

Development ended 1032 hrs, 22 June 1984

Quantity of water discharged during development 15 gallons

Type, size/capacity of pump or bailer used for development

Air lift (drilling rig) with variable discharge

Depth of open hole inside well

Before development 25 feet (ft)

After development 25 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conduc-tivity	Remarks
1012	Red-brown, heavy silt	Not determined	Silt	--	--	Wearing respirators
	Slowly clearing					
1032	Clear	--	None	--	--	Production approx. 1/2 gpm

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CORPORATION

Well Completion Log: Sheet 1/2

Boring or Well No. 7G
Project Tinker AFB IRP Phase II Stage 2
Location East edge of Landfill 6
Log Recorded By W.M. Little

Construction started 21 June 1984 completed 22 June 1984
Development started 22 June 1984 completed 22 June 1984

Total depth drilled (ft) 30 feet
Hole diameter 8 inch
Drilling method air rotary
Problems encountered during drilling None

Water source for drilling and completion procedures base supply

Number and type of samples collected Grab samples from discharge

Sample interval (ft-ft) variable
Storage method(s) plastic bags, ambient temperature

Casing type Schedule 80 PVC, flush joint Diameter 2 inches
Depth of casing (ft) 13 feet
Screen type Schedule 40, PVC, mill slot Diameter 2 inches
Slot size 0.020 inches Screen interval (ft-ft) 13-28 feet
Type(s) of glue used to join casing none

Type of gravel pack used 8-12 sand
Amount of gravel pack used see next page
Grain size distribution of gravel pack see specification sheet
Lithology of gravel pack Quartz, trace rock fragments
Source (company and quarry/pit) Arkhola Sand & Gravel, Ft. Smith, AR

Interval of gravel pack (ft-ft) 10-28 feet
Interval of bentonite seal (ft-ft) 5-10 feet
Interval of grouting (ft-ft) 0-5 feet

Description of security measures 8 inch steel protective casing and lid; secured with padlock

Padlock ID No. Master 3213 Location of key(s) TAFB/SGB, DEEP; Radian

RADIAN CORPORATION

Well Completion Log: Sheet 2/2

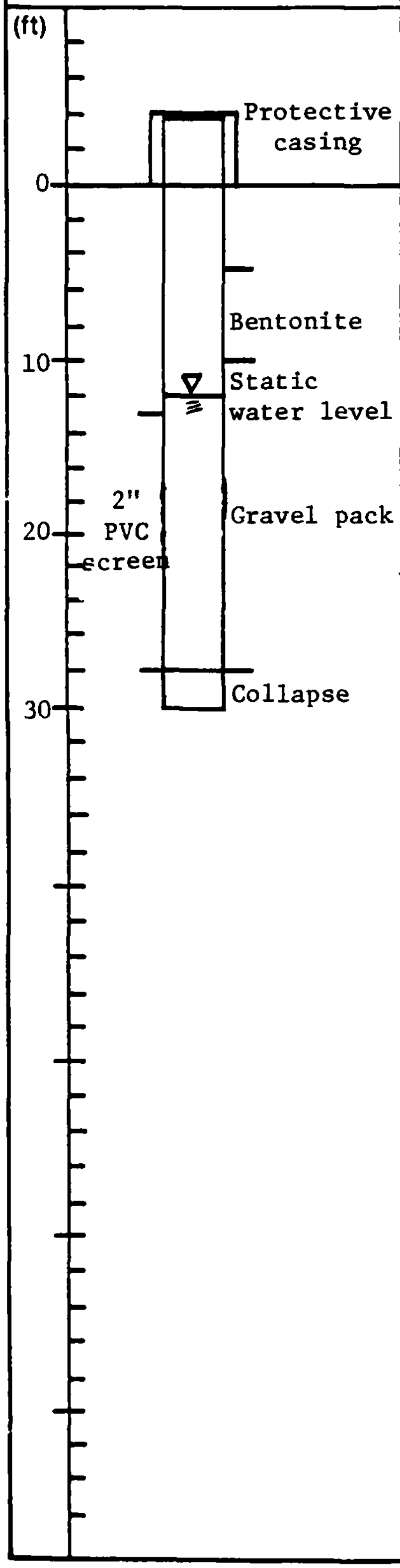
Boring or Well No. 7G

Project Tinker AFB IRP Phase II Stage 2

Location East edge of Landfill 6

Log Recorded By W.M. Little

Construction Schematic



Static level of water before 12 feet (ft) and after 12 feet (ft) development

Development started 0840, 22 June 1984

Development ended 0900, 22 June 1984

Quantity of water discharged during development 15 gallons

Type, size/capacity of pump or bailer used for development
Air lift (drilling rig) with variable discharge

Depth of open hole inside well
Before development 28 feet (ft)
After development 28 feet (ft)

Development Record

Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	Ph	Conductivity	Remarks
0840	Red, heavy silt	Not determined	Silt	--	--	Wearing respirator. Initial production approx. 1+ gpm.
0850	Lighter color & turbidity					Production slows to approx. 1/2 gpm.
0900	Light grey-red silt	--	Silt			

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APPENDIX E

Raw Field Data

Sediment Sampling

RADIAN CORPORATION — **CALCULATION SHEET**

CALC. NO. ______

SIGNATURE ______ DATE 6/19/84 CHECKED WML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF 1 SHEETS

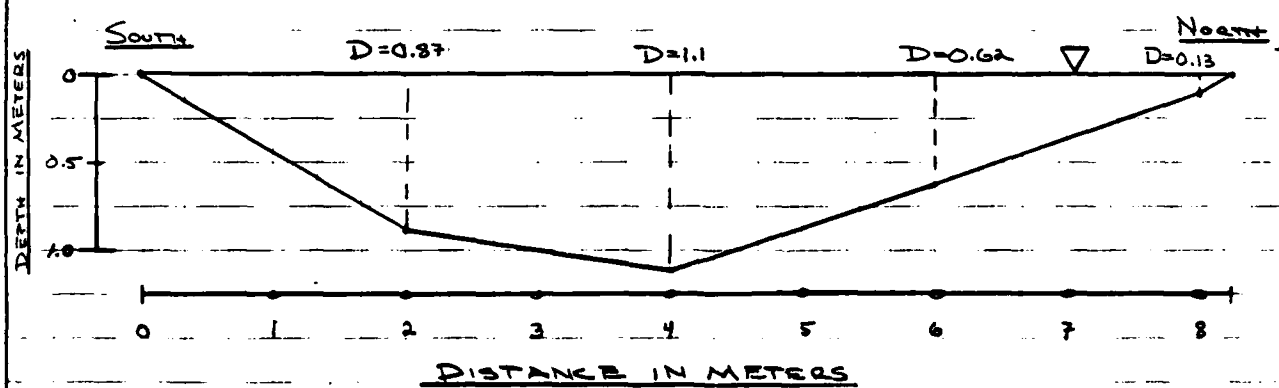
STATION: T-SED-Ø1-CC1 (Crutcho Creek)

LOCATION: North side of concrete culvert under Patrol Rd., 150 ft. east of Reserve/Pond Rd.

SEDIMENT DESCRIPTION: Silty clay, red. Grey layer of sand encountered just below surface.

NOTES: Twelve-inch sediment plug collected at edge of pond in non-flowing creekbed. Section of creek north of the sampling point appears to be disturbed. Culvert outlet internal diameter = 1.95 meters.

CROSS-SECTION AT THE SAMPLING POINT



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/19/84 CHECKED YYML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF 1 SHEETS

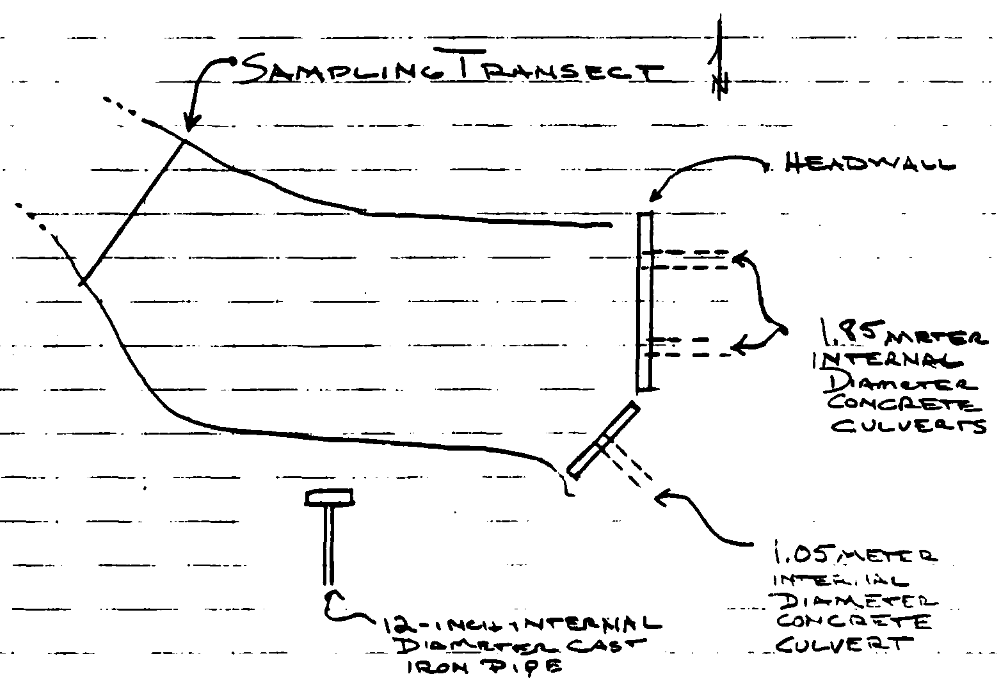
STATION: T-SED-02-CC1

LOCATION:

SEDIMENT DESCRIPTION: GRAVELLY SAMPLE

NOTES: SAMPLE COMPOSITED FROM THREE LOCATIONS ALONG TRANSECT. TWELVE-INCH PLUGS OF SEDIMENTS COLLECTED AT EACH SAMPLING POINT FOR COMPOSITING

SCHEMATIC OF SAMPLING TRANSECT:



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ____

SIGNATURE ____ DATE 6/19/84 CHECKED WML DATE ____

PROJECT Tinker AFB JOB NO. ____

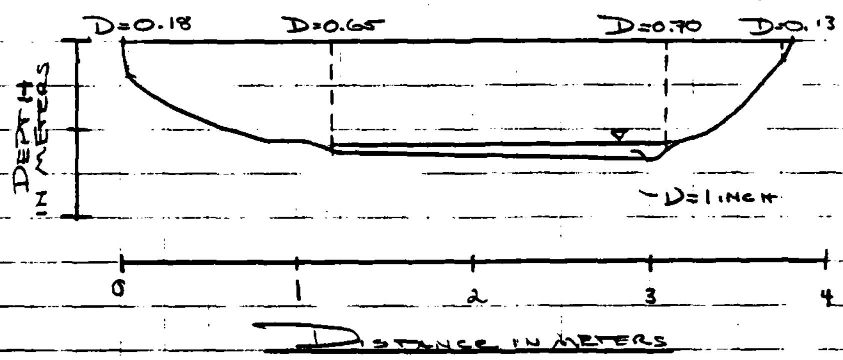
SUBJECT Sediment Sampling SHEET 1 OF 2 SHEETS

STATION: T-SED-Ø2-CC1 (CONDT.)

CROSS-SECTION AT THE SAMPLING POINT:

FACING DOWNSTREAM

SOUTHWEST NORTHEAST



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ________

SIGNATURE ________ DATE 6/19/84 CHECKED WML DATE ________

PROJECT Tinker AFB JOB NO. ________

SUBJECT Sediment Sampling SHEET ____ OF ____ SHEETS

STATION: T-SED-Ø3-CC1

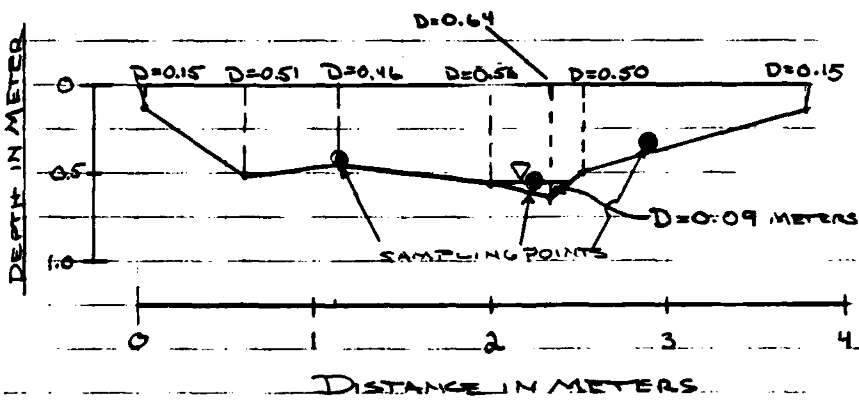
LOCATION:

SEDIMENT DESCRIPTION:

NOTES: THREE, 6-INCH PLUGS COLLECTED FOR COMPOSITING AS SAMPLE. ROOTS PREVENTED RETREIVAL OF DEEPER PLUGS

CROSS-SECTION AT THE SAMPLING POINT:

FACING UPSTREAM



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/19/84 CHECKED WML DATE ______

PROJECT TINKER AFB JOB NO. ______

SUBJECT SEDIMENT SAMPLING SHEET 1 OF ______ SHEETS

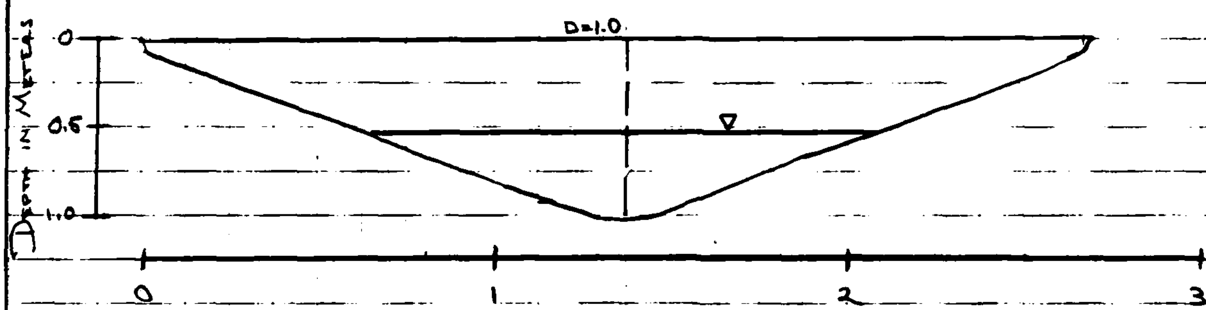
STATION: T-SED-Ø4-CC4 & T-SED-Ø5-CC1 (DUPLICATE)

LOCATION: 50 FEET UPSTREAM OF TOWER ROAD

SEDIMENT DESCRIPTION:

NOTES: SAMPLE COLLECTED AS COMPOSITE FROM SEDIMENT PLUGS COLLECTED NEAR EDGE OF WATER

CROSS-SECTION AT ~~THE~~ SAMPLING POINT:



DISTANCE IN METERS

FACING DOWNSTREAM

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO.

SIGNATURE DATE 6/19/84 CHECKED DATE

PROJECT Tinker AFB JOB NO.

SUBJECT Sediment Sampling SHEET 1 OF SHEETS

STATION: T-SED-06-EC20
LOCATION: 50 FEET UPSTREAM OF CULVERT ON PATROL ROAD
SEDIMENT DESCRIPTION:
NOTES: SAMPLE COLLECTED FROM 12-INCH PLUG. PLUG COLLECTED AT POINT IN CREEK BOTTOM CONTAINING NO VEGETATION. AREA OF SAMPLE FLAT & LEVEL. CREEK DRY AT TIME OF SAMPLING.

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED ______ DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF ______ SHEETS

STATION: T-SED-07-CC12

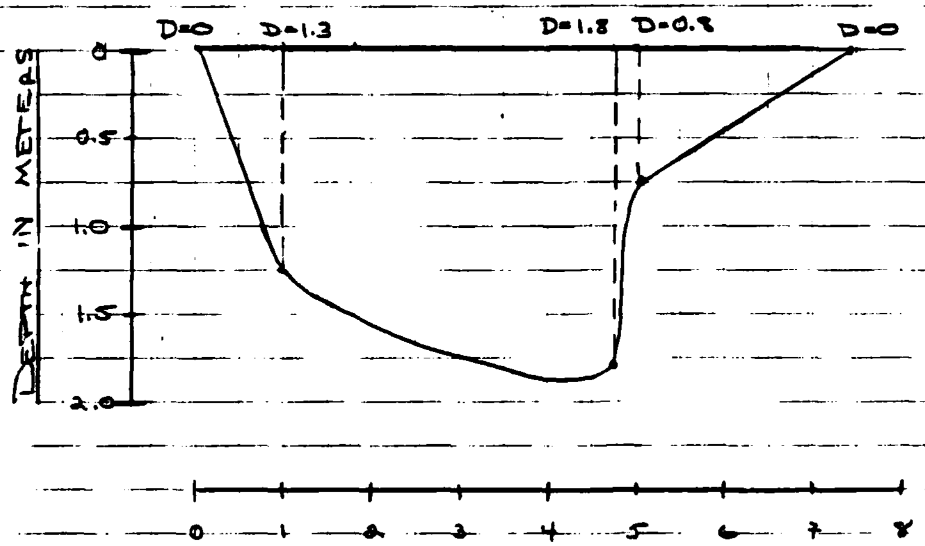
LOCATION:

SEDIMENT DESCRIPTION:

NOTES: SAMPLE COLLECTED AT AT ONE LOCATION NEAR EDGE OF WATER. NO FLOW, STANDING WATER TRASH & DEBRIS IN CREEK.

CROSS-SECTION AT THE SAMPLING POINT:

FACING DOWNSTREAM



DISTANCE IN METERS

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED ______ DATE ______

PROJECT TINKER AFB JOB NO. ______

SUBJECT SEDIMENT SAMPLING SHEET 1 OF ______ SHEETS

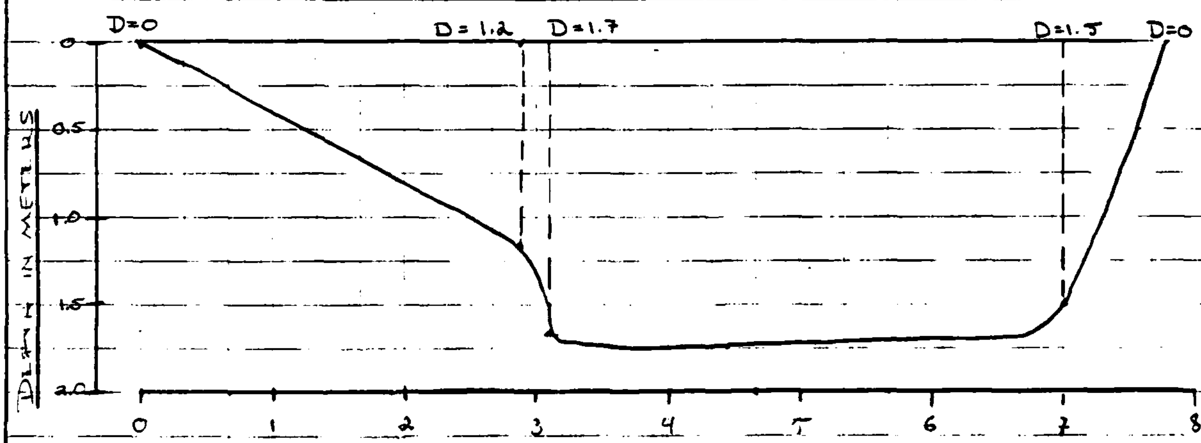
STATION: T-SED-Ø8-CC13

LOCATION: SAMPLE COLLECTED MIDWAY BETWEEN ABANDONED RAIL CROSSING AND CHAIN-LINK FENCE

SEDIMENT DESCRIPTION:

NOTES: NO MINNOWS AT SAMPLING POINT. SOME WATER STRIDERS NOTED. SINGLE PLUG COLLECTED AS SAMPLE.

CROSS-SECTION AT THE SAMPLING POINT:



DISTANCE IN METERS

FACING UPSTREAM

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED ______ DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF ______ SHEETS

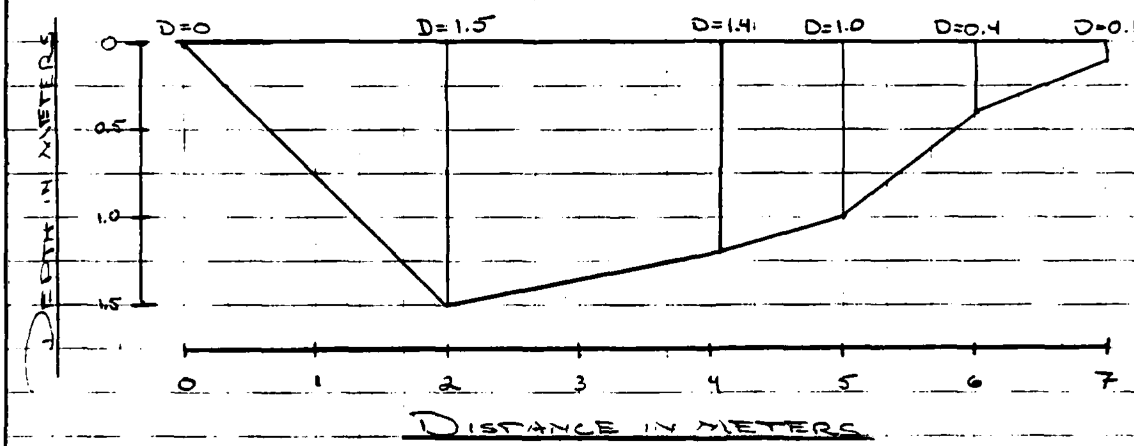
STATION: T-SED-Ø9-KC22

LOCATION: GOLF COURSE, HALF-WAY BETWEEN CULVERT AND FOOT BRIDGE

SEDIMENT DESCRIPTION: GRAVELLY

NOTES: CHANNEL HAS GRAVELLY BOTTOM. SMELLED OF JET FUEL.

CROSS-SECTION AT THE SAMPLING POINT:



FACING DOWNSTREAM

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED ______ DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF ______ SHEETS

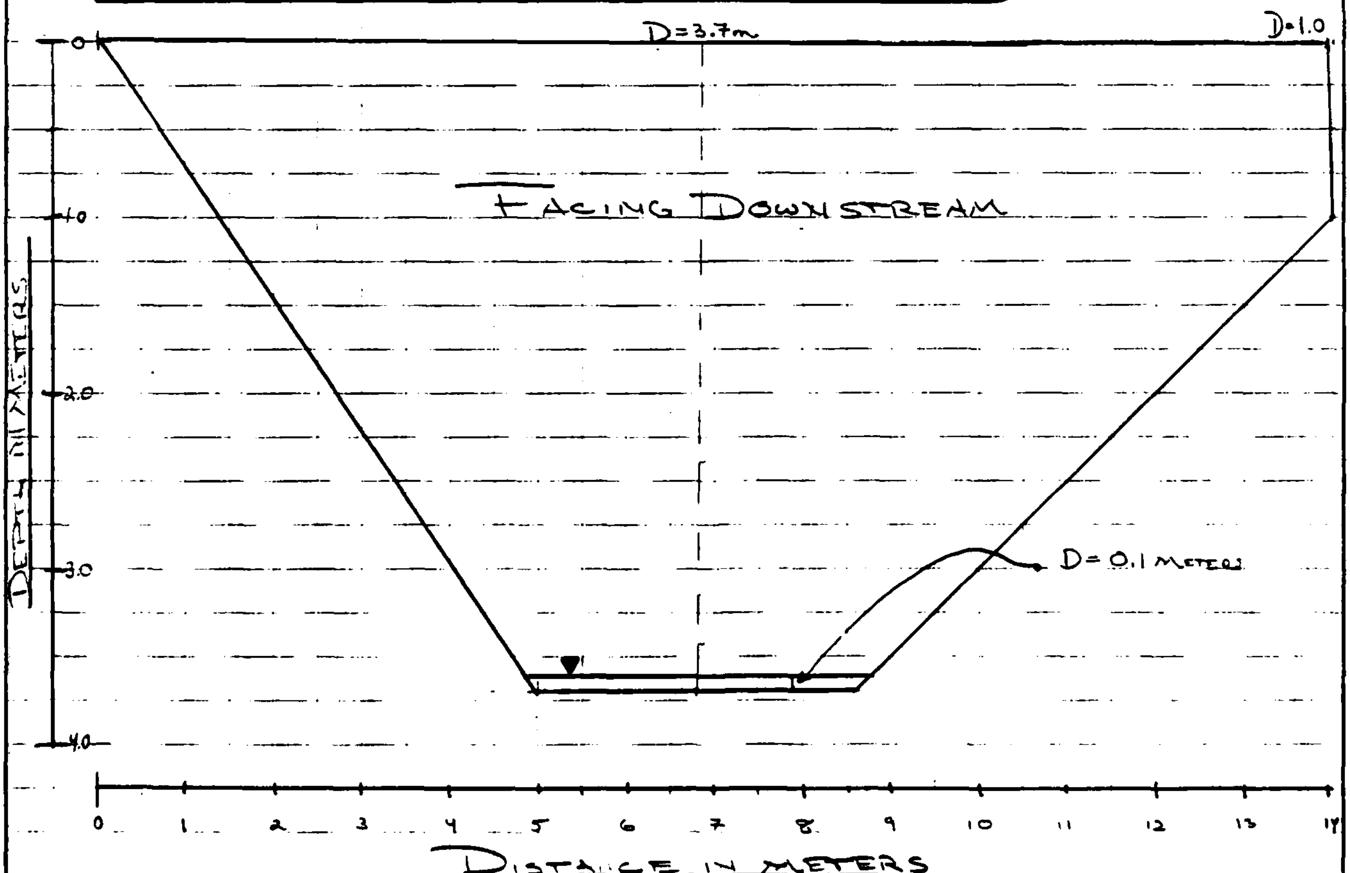
STATION: T-SED-10-KC21

LOCATION:

SEDIMENT DESCRIPTION:

NOTES: SAMPLE COLLECTED FROM THREE SURFICIAL PLUGS. SEDIMENT IN CREEK BOTTOM OVERLAPS BEDROCK AT A DEPTH OF ~6 INCHES. SAMPLE SMELLS OF JET FUEL.

CROSS-SECTION AT THE SAMPLING POINT:



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED WML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF ______ SHEETS

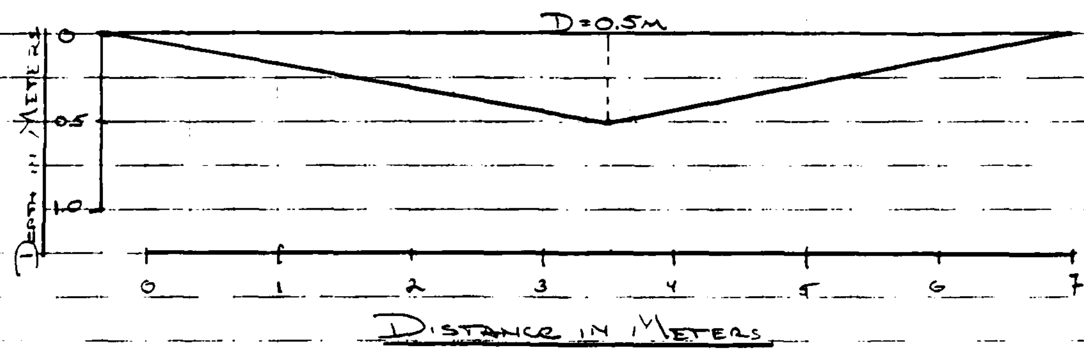
STATION: T-SED-11-SC17

LOCATION: AT STREAMBANK, UPSTREAM OF V-NOTCH WEIR.

SEDIMENT DESCRIPTION: BLACK, SOFT SILTY CLAY

NOTES: WATER FLOWING IN WEIR 0.15 M FROM CREST

CROSS-SECTION AT THE SAMPLING POINT:



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CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED WML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF ______ SHEETS

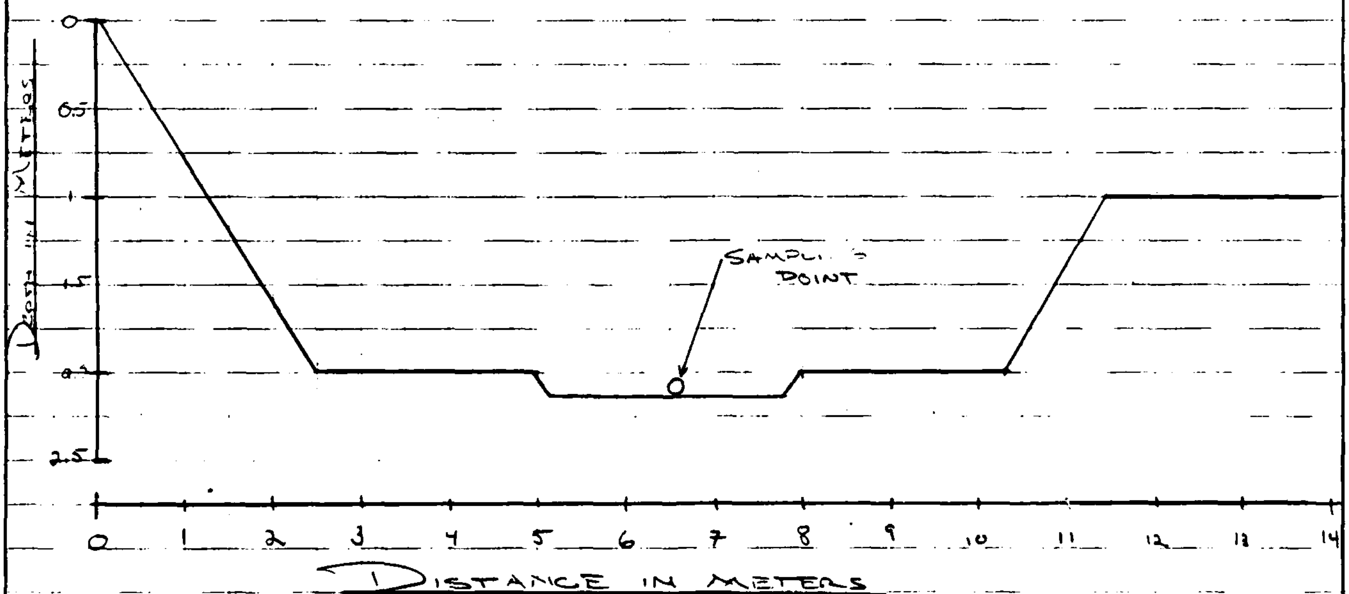
STATION: T-SED-12-SC18

LOCATION: SAMPLE COLLECTED IMMEDIATELY UPSTREAM OF BROAD-CRESTED WIER

SEDIMENT DESCRIPTION: RED CLAY w/ GRAVEL

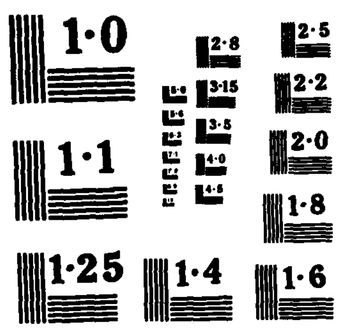
NOTES: SAMPLE COLLECTED FROM CENTER OF CHANNEL. WHITE FILIMENTOUS ALGAE PRESENT

CROSS-SECTION AT THE SAMPLING POINT:



4-81-3361

AD-A162 911 INSTALLATION RESTORATION PROGRAM PHASE II 2/6
CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN
TX R W BAUER ET AL. OCT 85 RAD-85-212-027-21-03-VOL-2
UNCLASSIFIED F33615-83-D-4001 F/G 13/2 NL



NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED XYML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET 1 OF ______ SHEETS

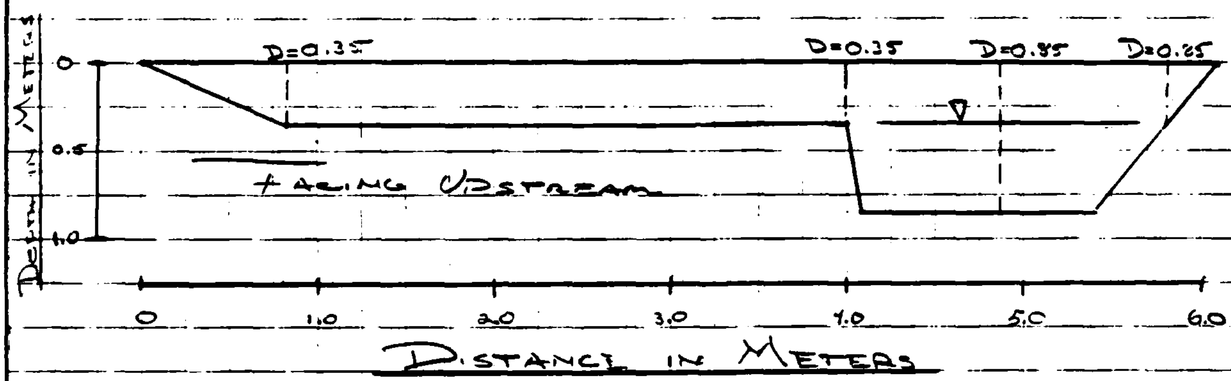
STATION: T-SED-13-SC-15 & T-SED-18-SC15 (Duplicate)

LOCATION: 50 FEET DOWNSTREAM OF CULVERT

SEDIMENT DESCRIPTION:

NOTES: SAMPLE COLLECTED AS A COMPOSITE OF THREE PLUGS. PLUGS COLLECTED FROM EACH BANK AND CENTER OF CHANNEL. VELOCITY ~ 0.5 FPS

CROSS-SECTION AT THE SAMPLING POINT:



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED WML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ______ OF ______ SHEETS

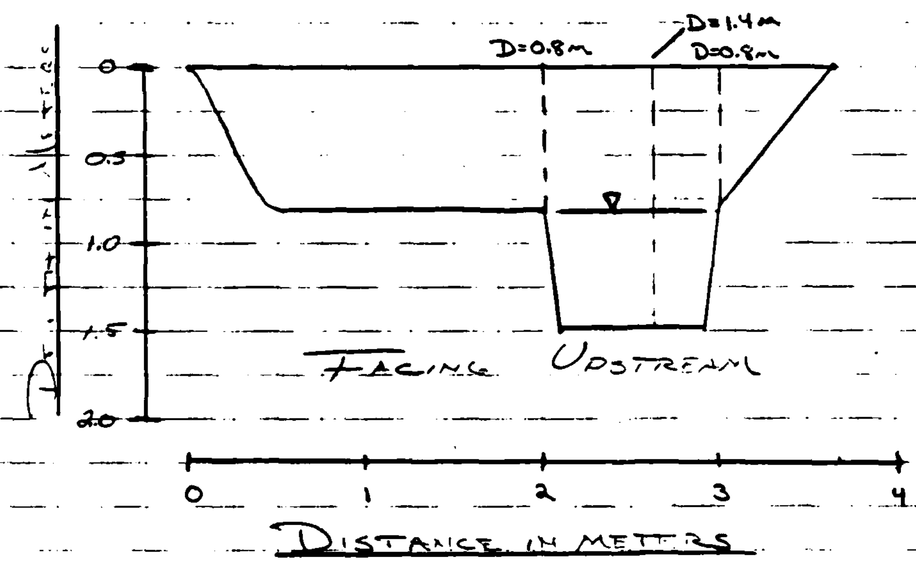
STATION: T-SED-15-SC14

LOCATION:

SEDIMENT DESCRIPTION: SANDY GRAVEL

NOTES: WATER IN CHANNEL VERY TURBID. WATER SURFACE OILEY. STREAM ABIOTIC. NOTCHED WIER 75 FEET UPSTREAM. SAMPLE COLLECTED FROM BANK AND CENTER OF CHANNEL (COMPOSITED). RECTANGULAR, NARROW CHANNEL VELOCITY ~ 0.1 FT/S

CROSS-SECTION AT THE SAMPLING POINT:



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RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED WML DATE ______

PROJECT TINKER AFB JOB NO. ______

SUBJECT SEDIMENT SAMPLING SHEET ______ OF ______ SHEETS

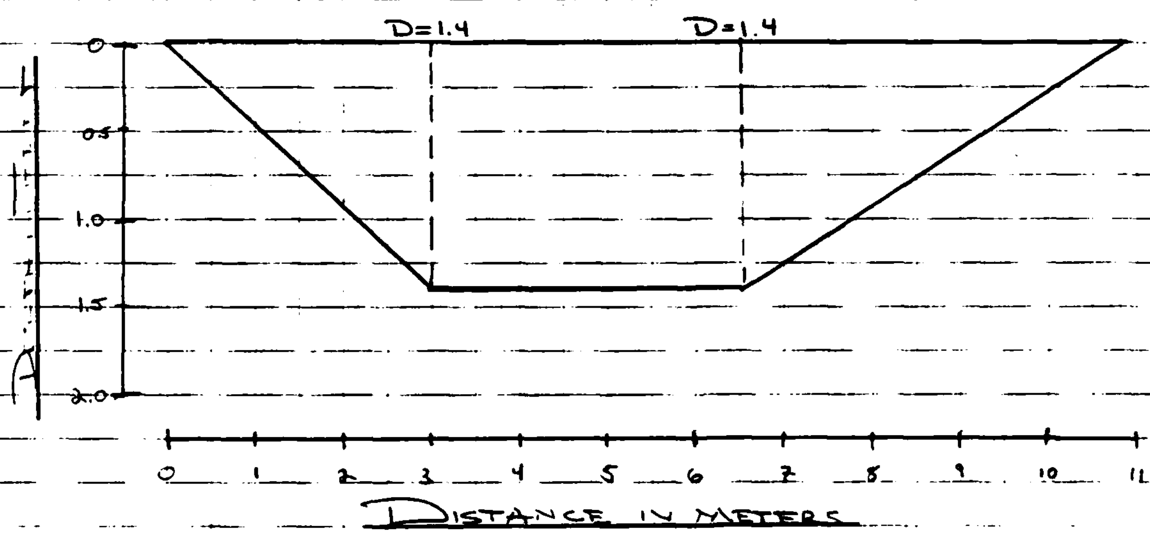
STATION: T-SED-16-SC-19 & SC-19 (DUPLICATE)

LOCATION:

SEDIMENT DESCRIPTION: SANDY SAMPLE, COLLECTED FROM BOLDER STREWN SECTION

NOTES: SAMPLE DIFFICULT TO OBTAIN. APPROXIMATELY 6 INCHES OF SEDIMENT COLLECTED AS SAMPLE. VELOCITY AT SAMPLING POINT ~2 FPS.

CROSS-SECTION AT THE SAMPLING POINT:



FACING DOWNSTREAM

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ____

SIGNATURE ____ DATE 6/21/84 CHECKED WML DATE ____

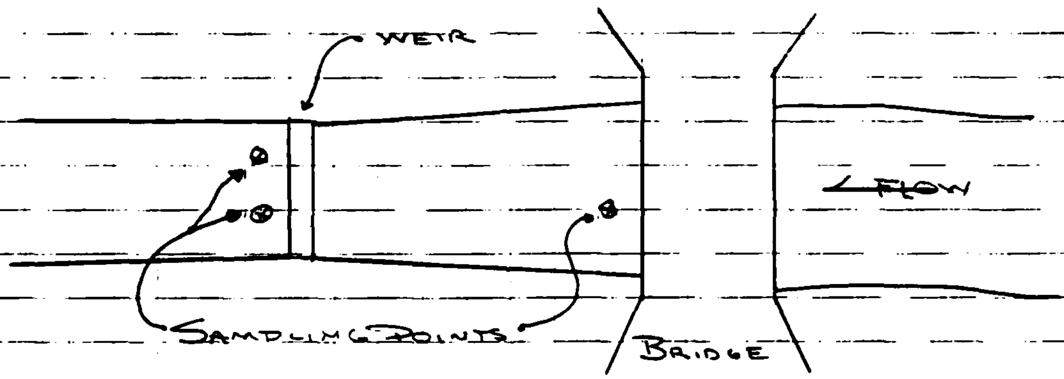
PROJECT TINKER AFB JOB NO. ____

SUBJECT SEDIMENT SAMPLING SHEET ____ OF ____ SHEETS

STATION: T-SED-19-CC-10

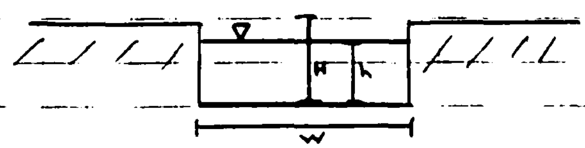
LOCATION: SAMPLE COMPOSITED FROM THREE PLUGS. TWO OF THE PLUGS COLLECTED IMMEDIATELY DOWNSTREAM OF THE WEIR. ONE COLLECTED JUST DOWNSTREAM OF THE BRIDGE. ALL SAMPLES COLLECTED FROM THE CENTER OF THE CREEK, AS SHOWN BELOW.

LOCATION SCHEMATIC:



SEDIMENT DESCRIPTION:

NOTES: WATER VERY FOAMY AFTER WEIR. CLEAR UPSTREAM OF WEIR. V-NOTCH REMOVED FROM WEIR. DIMENSIONS OF WEIR ARE SHOWN BELOW.



H = 0.310 M
W = 0.612 M
h = 0.244 M

STREAM CHANNEL AT WEIR IS 4.1 METERS ACROSS

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

SIGNATURE ______ DATE 6/20/84 (7/19/84 (FOLLOW-UP)) CHECKED WML DATE ______ CALC. NO. ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ____ OF ____ SHEETS

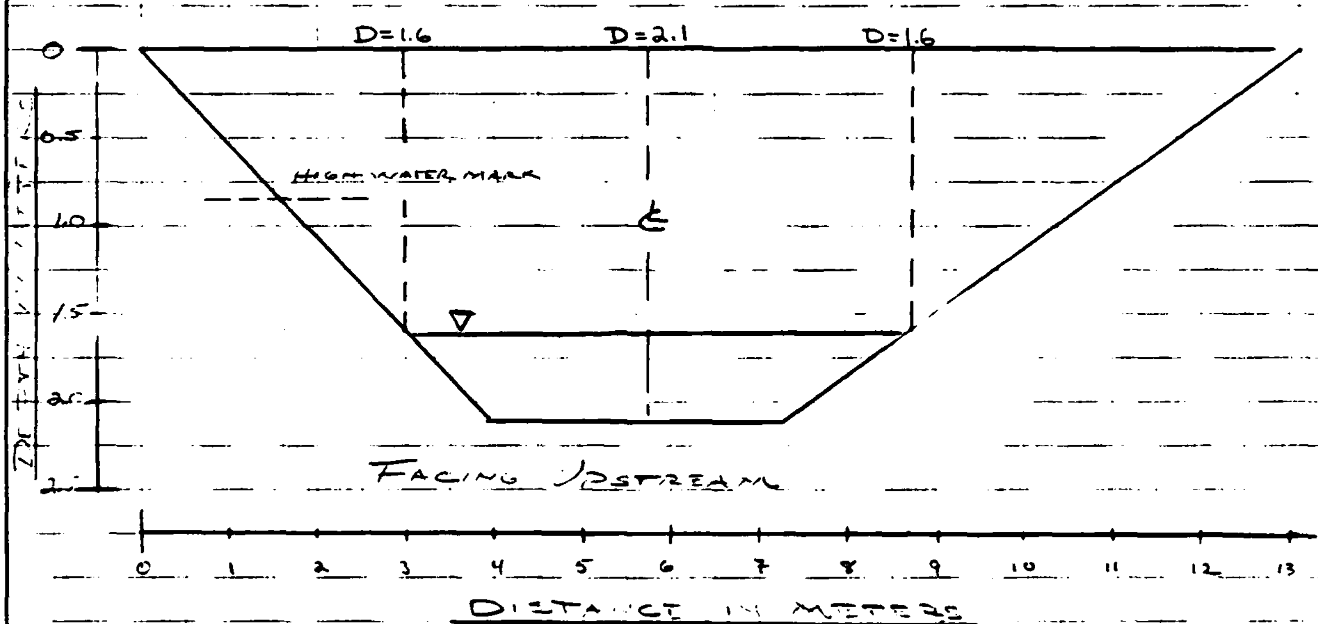
STATION: T-SED-20-CC-8

LOCATION: IMMEDIATELY DOWNSTREAM OF BRIDGE. CONTROL STRUCTURE 100 FT. UPSTREAM.

SEDIMENT DESCRIPTION: SOFT SILT

NOTES: TURTLES AND A MINNOW SEEN IN WATER AT SAMPLING LOCATION. GREEN HERON ALSO SEEN. ALGAL GROWTH NOTED IN BOTTOM OF BED. OILY FILM NOTED ON WATER. VELOCITY OF FLOW ~0.2 FPS.

CROSS-SECTION AT THE SAMPLING POINT:



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RADIAN CORPORATION — CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/21/84 CHECKED WML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ______ OF ______ SHEETS

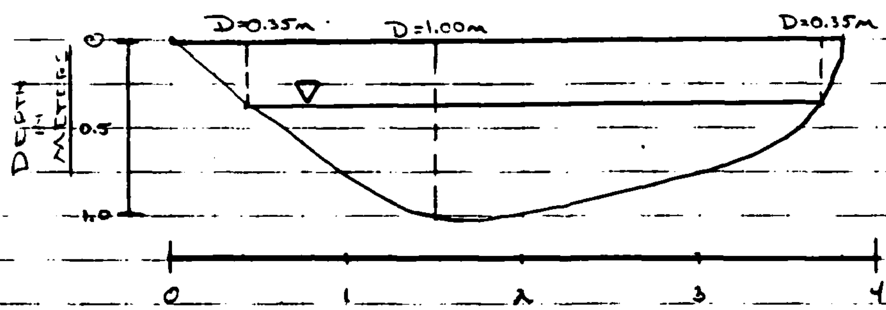
STATION: T-SED-21822-CC9 (DUPLICATE SAMPLES)

LOCATION: SAMPLE COLLECTED IMMEDIATELY UPSTREAM OF BEAVER DAM

SEDIMENT DESCRIPTION:

NOTES: SERIES OF BEAVER DAMS LINE CREEK IN THE AREA OF THE SAMPLING POINT. SAMPLE COLLECTED JUST BELOW MIDDLE DAM. LANDFILL LOCATED APPROXIMATELY 150 FT TO THE SOUTH. FOAM DEVELOPS WERE TURBULENCE IS ENCOUNTERED SUCH AS BELOW BEAVER DAMS. FOAM CLEARS QUICKLY ~5 METERS DOWNSTREAM.

CROSS-SECTION AT THE SAMPLING POINT:



FACING UPSTREAM

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

SIGNATURE ______ DATE 6/21/84 (7/19/84 (FOLLOW-UP)) CHECKED WML DATE ______ CALC. NO. ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ____ OF ____ SHEETS

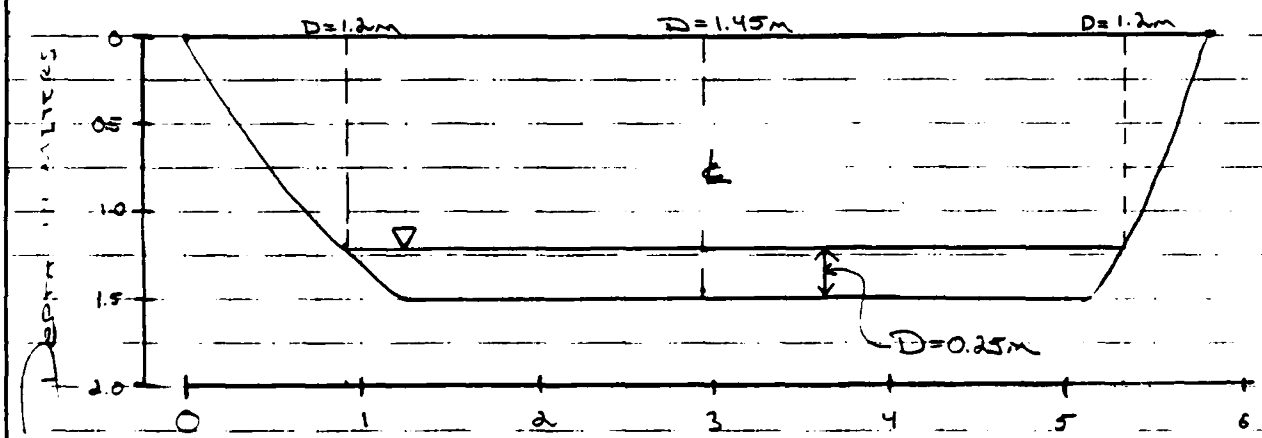
STATION: T-SED-22-CC7 (INITIAL SAMPLE BROKEN/LOST)

LOCATION: IMMEDIATELY DOWNSTREAM OF OUTFALL

SEDIMENT DESCRIPTION:

NOTES: BANKS OF CHANNEL SATURATED TO WITHIN 1 FT OF TOP AND COVERED WITH ALGAE AS INDICATION OF RECENT HIGHER FLOWS. ENTIRE FLOW IN CHANNEL ORIGINATES FROM OUTFALL TO EAST. NORTH OUTFALL HAS NO DISCHARGE. WATER FOAMY WITH PHENOLIC SMELL. DISCHARGE VELOCITY ~0.5 FPS.

CROSS-SECTION AT THE SAMPLING POINT:



FACING UPSTREAM

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/21/84 CHECKED WJAL DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ______ OF ______ SHEETS

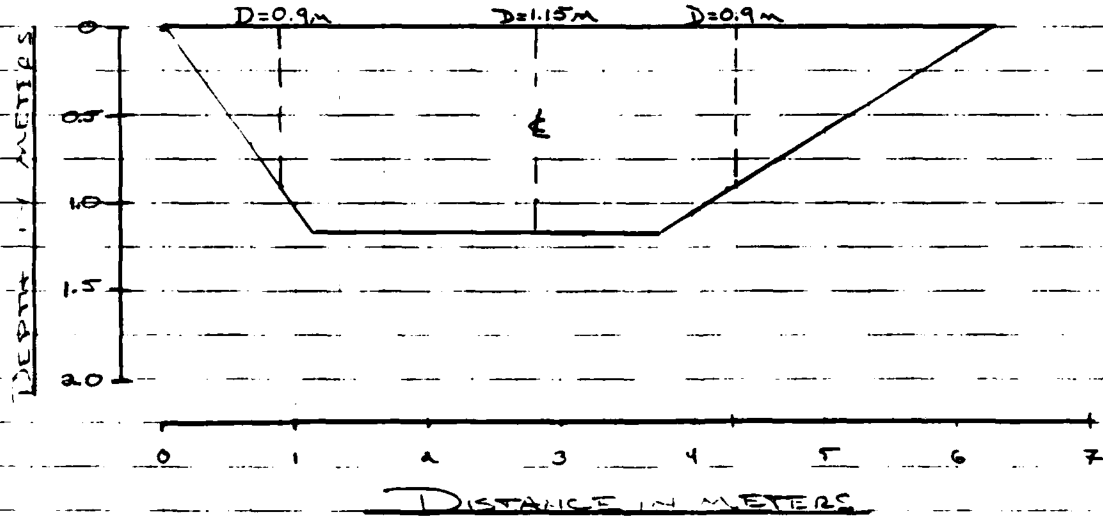
STATION: T-SED-24-CC6

LOCATION: SOUTH SIDE OF FENCED AREA.

SEDIMENT DESCRIPTION:

NOTES: SAMPLE COLLECTED FROM EAST DAY'S SOUTH SIDE OF FENCED AREA, SOUTH OF THE CULVERT.

CROSS-SECTION AT THE SAMPLING POINT:



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RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/21/84 CHECKED WML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ______ OF ______ SHEETS

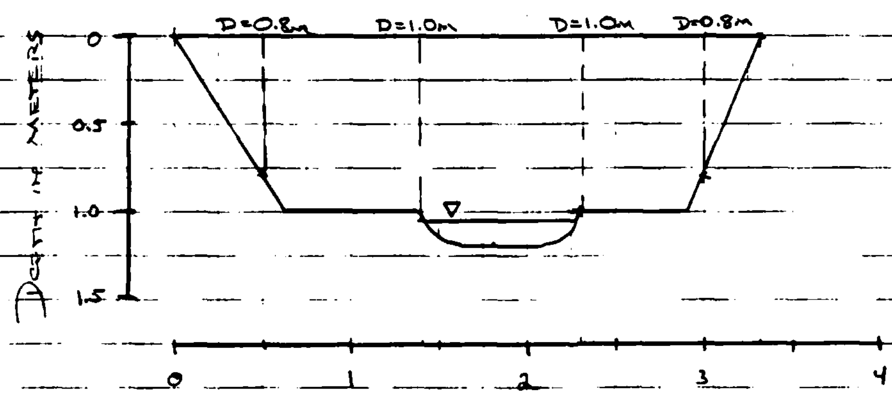
STATION: T-SED-25-CC-5

LOCATION:

SEDIMENT DESCRIPTION: HARD, BLACK

NOTES: WETTED BANKS COVERED WITH GREEN FILMENTOUS ALGAE. DISCHARGE CLEAR WITH A VELOCITY OF ~0.4 FPS.

CROSS-SECTION AT THE SAMPLING POINT:



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/21/84 CHECKED WML DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ______ OF ______ SHEETS

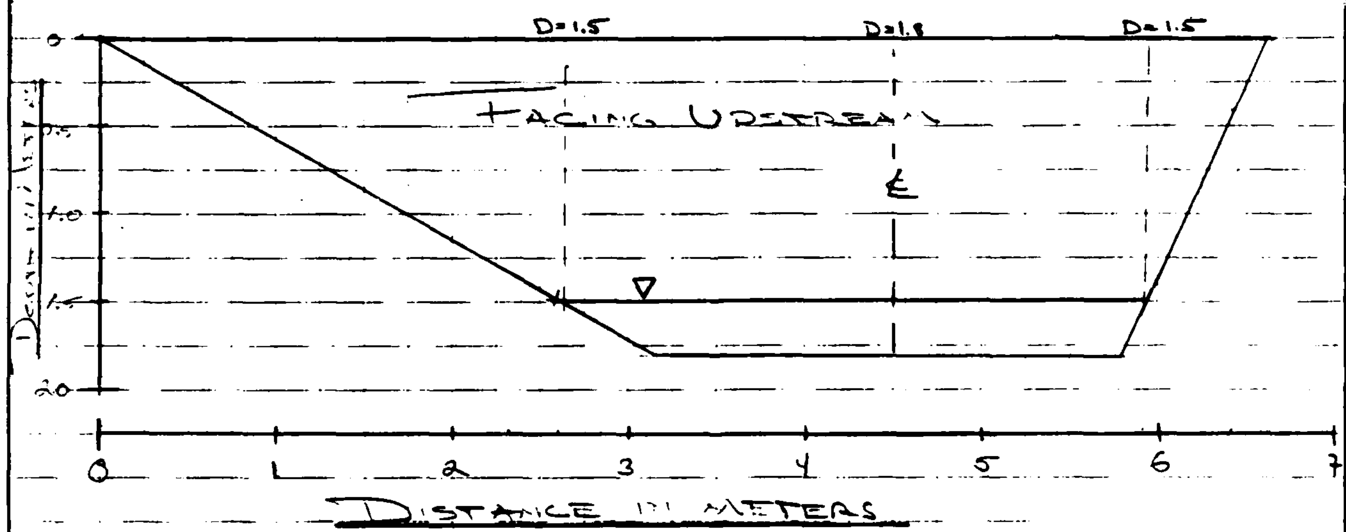
STATION: T-SED-26-CC-11

LOCATION: CRUTCHO CREEK AT THE GOLF COURSE.

SEDIMENT DESCRIPTION: RED SAND

NOTES: WATER VERY TURBID AT SAMPLING POINTS. SAMPLE COMPOSITED FROM PLUGS COLLECTED FROM THE CHANNEL 20 FEET UPSTREAM AND 100 FEET DOWNSTREAM OF FOOT BRIDGE. VELOCITY OF FLOW ~0.5 FPS

CROSS-SECTION AT THE SAMPLING POINT:



4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/20/84 CHECKED WML DATE ______

PROJECT TINKER AFB JOB NO. ______

SUBJECT SEDIMENT SAMPLING SHEET ______ OF ______ SHEETS

STATION: T-SED-14-SC16 (CONFLUENCE)

LOCATION: IMMEDIATELY UPSTREAM FROM TREATMENT PLANT (IWWTP)

SEDIMENT DESCRIPTION: RED SILT.

NOTES: STREAM 10 METERS ACROSS AT SAMPLING POINT. DEPTH APPROXIMATELY EIGHT INCHES. VELOCITY ~ 0.5 FPS. CHANNEL OBSCURED HERE. SAMPLE COMPOSITED FROM TWO PLUGS COLLECTED SIDE-BY-SIDE APPROXIMATELY 2 METERS FROM EAST BANK.

4-81-3361

RADIAN CORPORATION CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE 6/21/84 CHECKED ______ DATE ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ______ OF ______ SHEETS

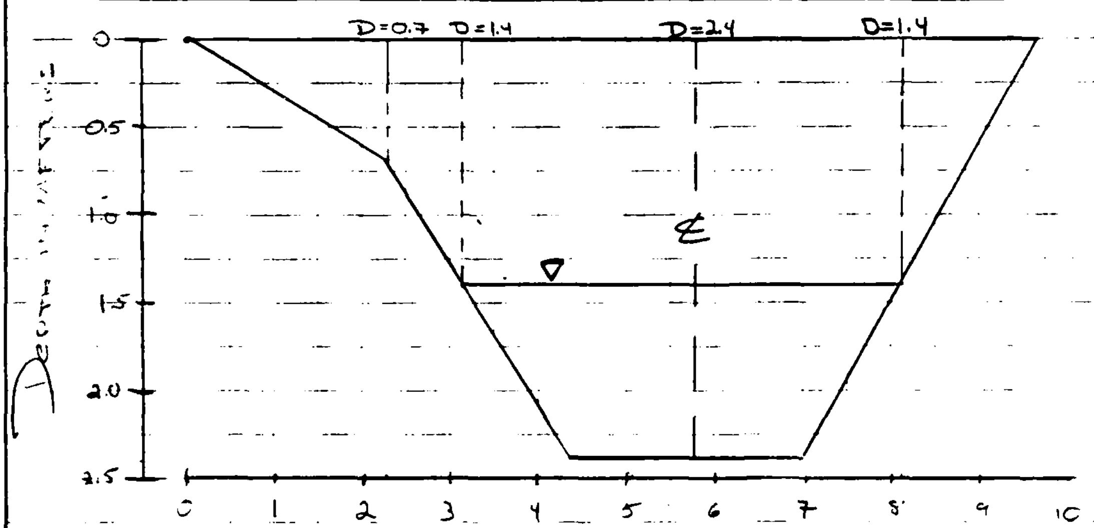
STATION: T-SED-27

LOCATION: KHULMAN CREEK AT THE GOLF COURSE. SAMPLE COLLECTED 25 FT UPSTREAM OF FOOT BRIDGE

SEDIMENT DESCRIPTION: BLACK, ORGANIC.

NOTES: OIL FILM NOTED ON WATER SURFACE AT THE SAMPLING POINT. FLOW VERY SLOW. MUSKRAT OBSERVED IN STREAM. BOTTOM OF STREAM CONSISTS OF A BLACK PLASTIC SUBSTANCE. SAMPLE COLLECTED AS A COMPOSITE OF 2 PLUGS. A PLUG WAS COLLECTED FROM EACH STREAM BANK.

CROSS-SECTION AT THE SAMPLING POINT:



DISTANCE IN METERS

FACING DOWN STREAM

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

SIGNATURE ______ DATE 6/20/84 7/19/84 FOLLOW-UP. CHECKED ______ DATE ______ CALC. NO. ______

PROJECT Tinker AFB JOB NO. ______

SUBJECT Sediment Sampling SHEET ______ OF ______ SHEETS

STATION: T-SED-28

LOCATION: AREA "D", 10 FEET SOUTH OF CULVERT APRON.

SEDIMENT DESCRIPTION: HARD, RED SOIL. DRY.

NOTES: POORLY DEFINED CHANNEL. SAMPLE COLLECTED FROM A SINGLE PLUG.

4-81-3361

RADIAN CORPORATION

Monitor Well Sampling

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ____________

SIGNATURE ____________ DATE ____________ CHECKED ____________ DATE ____________

PROJECT ____________ JOB NO. ____________

SUBJECT ____________ SHEET ______ OF ______ SHEETS

Well Number	Depth to Water	Depth to Bottom	Stickup (inches)	Date	Field ph	Field Cond.	Temp. (°C)	Sampler	Comments
6G	84.67	93.07	3.13	7/16/84	11.4	840	20	DHG/NPS	Well water very turbid. Much sediment.
					9.4	420			
					7.7				
				Sample	7.9	320			Approximately 15 gallons bailed by hand. The 3 measurements of ph and conductivity refer to the first 3 5-gallon bucketfulls.
6D	32.94	59.00	2.94	7/16/84	7.4	340		DHG/NPS	Measurements taken at approximately 5 gallon intervals. 22 gallons purged prior to sampling.
					6.8	330			
					7.0	330			
				Sample	7.0				
7F	19.20	28.45	3.25	7/71/84	6.3	900	18	DGH/NPS	Very red--high sediment.
				Sample	6.4				
7G	12.97	31.4	2.54	7/18/84	6.5	190	18	DHG/NPS	Very red--high sediment.
6A	60.00	80.45	3.53	7/18/84	6.5-7	345	21		
6B	67.28	92.68	3.01	7/18/84	6.5-7	460	20	NPS/DHG	
6C	69.69	85.28	2.20	7/18/84	6.5-7	750	19.5	NPS/DHG	Pump broke at approximately 2 well casings; bailed the rest.
6G	85.00	93.32		7/30/84	8.1	560		NPS/DHG	Field duplicate. After evacuating approximately 10 gallons, well pumped dry. Waited for well to recover and then sampled (approximately 45 minutes). 601, 624/625.

4-81-3361

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE ______ CHECKED ______ DATE ______

PROJECT ______ JOB NO. ______

SUBJECT ______ SHEET ______ OF ______ SHEETS

Well Number	Depth to Water	Depth to Bottom	Stickup (inches)	Date	Field ph	Field Cond.	Temp. (°C)	Sampler	Comments
6E	63.11	115.55		7/30/84	7.4	490	18	NPS/DHG	Pumped 100 gal. before sampling.
6F	84.15	105	2.61	7/30/84	7.2	720	18	NPS/DHG	pH=7.1, C=740 @ 18 gal. Pumped 40 gal. before sample. 601, 624/625. Left to go set up next well and DPDO closed so grabbed sample first thing on 7/31/84.
7C	72.40	101.5	2.93	7/30/84	7.1	420	17	NPS/DHG	601, 624/625.
7A	79.18	108.8	3.60	7/31/84	7.2	590	17	NPS/DHG	@ 33 gal., pH=7.1, C=590. 55 gal. evacuated. 601, 624/625.
6D	32.85			7/31/84	7.2	590	18	NPS/DHG	Field duplicate for 601, 624/625. @ 15 gal. pH = 7.2, C=600. @ 30 gal., pH=7.2, C=600.
2A	39.46	48.97	3.0	7/31/84	6.6	960	18.5	NPS/DHG	@ approximately 8 gal., pH=6.7, C=960. Approximately 20 gal. evacuated. 601 only.
6C	69.74			7/31/84	7.2	700	19	NPS/DHG	30 gal. evacuated. 601 only.
7F	20.36			7/31/84	6.6	1400	19	NPS	20 L evacuated. 601.
6A	60.00			8/1/84	6.5	440	20	NPS/DHG	101.40 gal. evacuated.

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RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ______

SIGNATURE ______ DATE ______ CHECKED ______ DATE ______

PROJECT ______ JOB NO. ______

SUBJECT ______ SHEET ______ OF ______ SHEETS

Well Number	Depth to Water	Depth to Bottom	Stickup (inches)	Date	Field ph	Field Cond.	Temp. (°C)	Sampler	Comments
7G	13.03			8/1/84	6.0	250	17	NPS/DHG	@ approximately 25 gal., pH=6.8, C=620.
6B	Aprx. 67			8/1/84	6.8	640	19	NPS/DHG	@ approximately 35 gal., pH=6.8, C=600. 50 gal. evacuated. 601.
6D	32.9			8/1/84	7.2	580	18	NPS/DHG	@ 15 gal., pH= 7.2, C=590. @ 28 gal., pH= 7.2, C=580.
6G	84.69			8/1/84	7.7	530	19	NPS/DHG	Pumped dry @ approximately 12 gallons. Waited 20 min. for recovery. 601.
6E	62.88			8/14/84	7.3	450		DHG/AES	
6F	83.89				7.1	740			
7C	72.24			8/14/84	7.6	420		DHG/AES	
7A	79.17			8/15/84	8.8	570		DHG/AES	
7C	72.37			8/15/84	7.2	440		DHG/AES	

4-81-3361

Base Well Measurements

RADIAN CORPORATION

CALCULATION SHEET

CALC. NO. ____

SIGNATURE W.M. Little DATE ____ CHECKED ____ DATE ____

PROJECT Tinker AFB IRP Phase II, Stage 2 JOB NO. 212-027-21-01

SUBJECT Depth-To-Water Measurements, Base Wells SHEET ____ OF ____ SHEETS

Well No.	Date	Depth to Water (ft)	Height of Measuring Point (inches)	Comments
16	10/1/84	235'	15 1/2	Cascading water interferes with measurement.
15	"	220'	20 1/2	do.
14	"	-	-	No access.
17	"	205' 4"	2	Open casing.
18	"	100' 8 1/4"	4	do.
19	"	240' 8"	4	do., sound of cascading water.
13	10/8/84	-	-	No access.
12	"	-	-	No access.
11	"	260' 5"	10	
20	"	310' 18 1/2"	7	
21	"	230' 8"	8	
17	"	205' 26"	2	Re-measurement.
22	10/15/84	-	-	No access.
23	"	230' 23 1/4"	7	Cascading water.
24	"	-	-	No access.
25	"	-	-	do., access port plugged.
26	"	-	-	do.

4-81-3361

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Report of Base Surveyors

DEPARTMENT OF THE AIR FORCE
2854TH CIVIL ENGINEERING SQUADRON (AFLC)
TINKER AIR FORCE BASE, OKLAHOMA 73145

REPLY TO ATTN OF: DEEE (Sgt Deguzman, 42868) 21 Aug 84

SUBJECT: Elevation Survey of IRP Phase II, Stage 2 Wells (Your Ltr, 2 Aug 84)

TO: USAFH/SGB

Results of wells survey, as per your request, is found on Attachment 1.

DAVID A. BURRIS, Chief
Engrg & Envmtl Planning Branch

2 Atch
1. Well Elevations
2. USAFH/SGB Ltr, 2 Aug 84

AFLC — Lifeline of the Aerospace Team

Atch 2

DEPARTMENT OF THE AIR FORCE
USAF HOSPITAL TINKER (AFLC)
TINKER AIR FORCE BASE, OKLAHOMA 73145

2 AUG 1984

REPLY TO ATTN OF: SGB

SUBJECT: Elevation Survey of IRP Phase II, Stage 2 Wells

TO: 2854 CES/DEE

Radian Corp requests that absolute well elevations surveys be obtained by 22 Aug 84 for the six on-base wells shown on attachment one. Similarly, they request that absolute elevations be obtained for the seven wells shown on attachment two. These wells rise about three feet above the ground surface and are approproximately eight inches in diameter. This data is needed to verify groundwater flow direction. Questions regarding this request should be addressed to Capt Cornell at ext 47844.

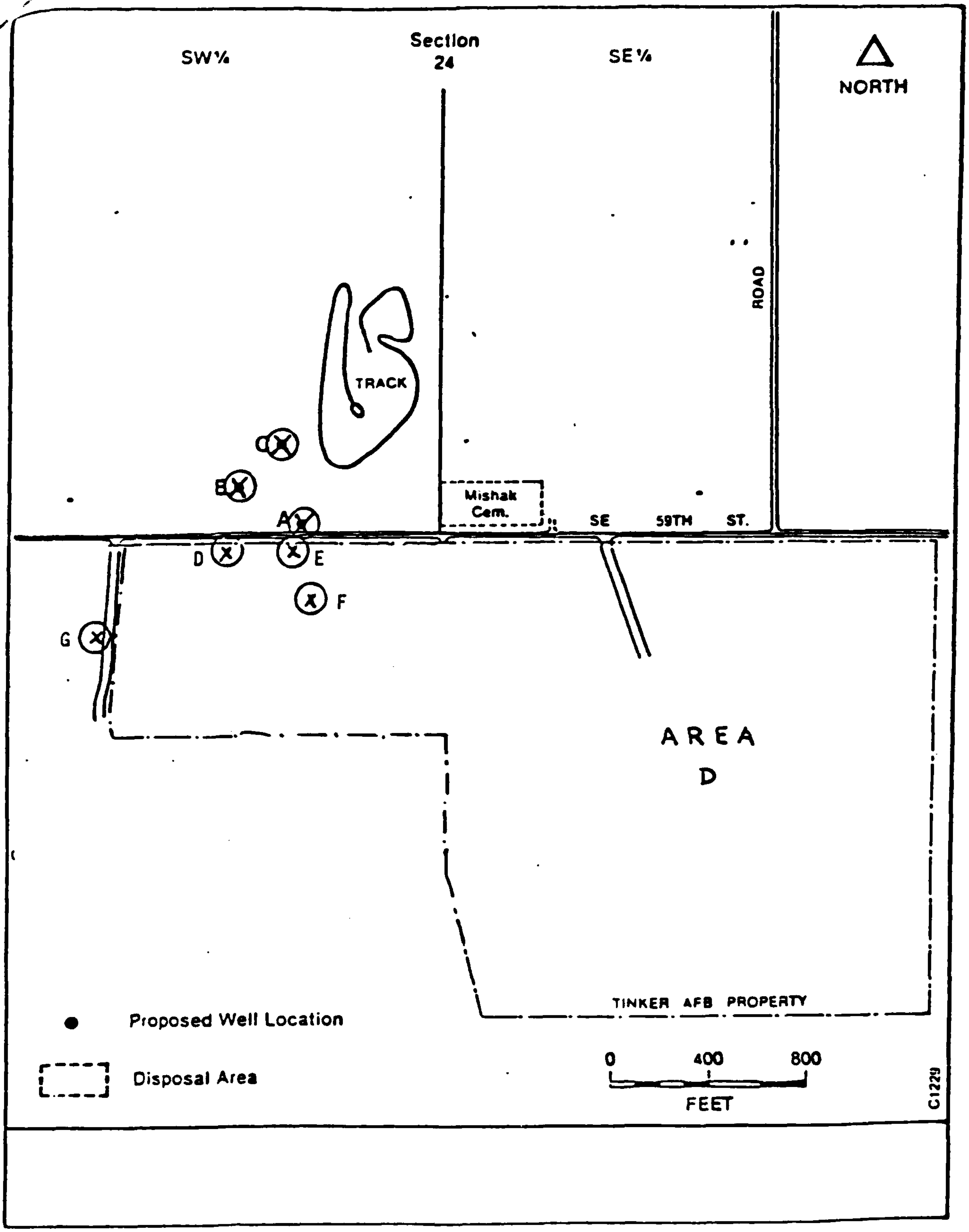
D.W. McElwey

DAVID W. McELWEY, Lt Col, USAF, BSC
Chief, Bioenvironmental Engineering Division

2 Atch:
1)On-base well locations
2)Off-base well locations

2 AUG [illegible]

AFLC - Lifeline of the Aerospace Team


Section 24
SW¼
SE¼
NORTH
ROAD
TRACK
Mishak Cem.
SE 59TH ST.
A
B
C
D
E
F
G
AREA D
TINKER AFB PROPERTY
Proposed Well Location
Disposal Area
0
400
800
FEET
C1229

Atch Z[3]

DRAFT

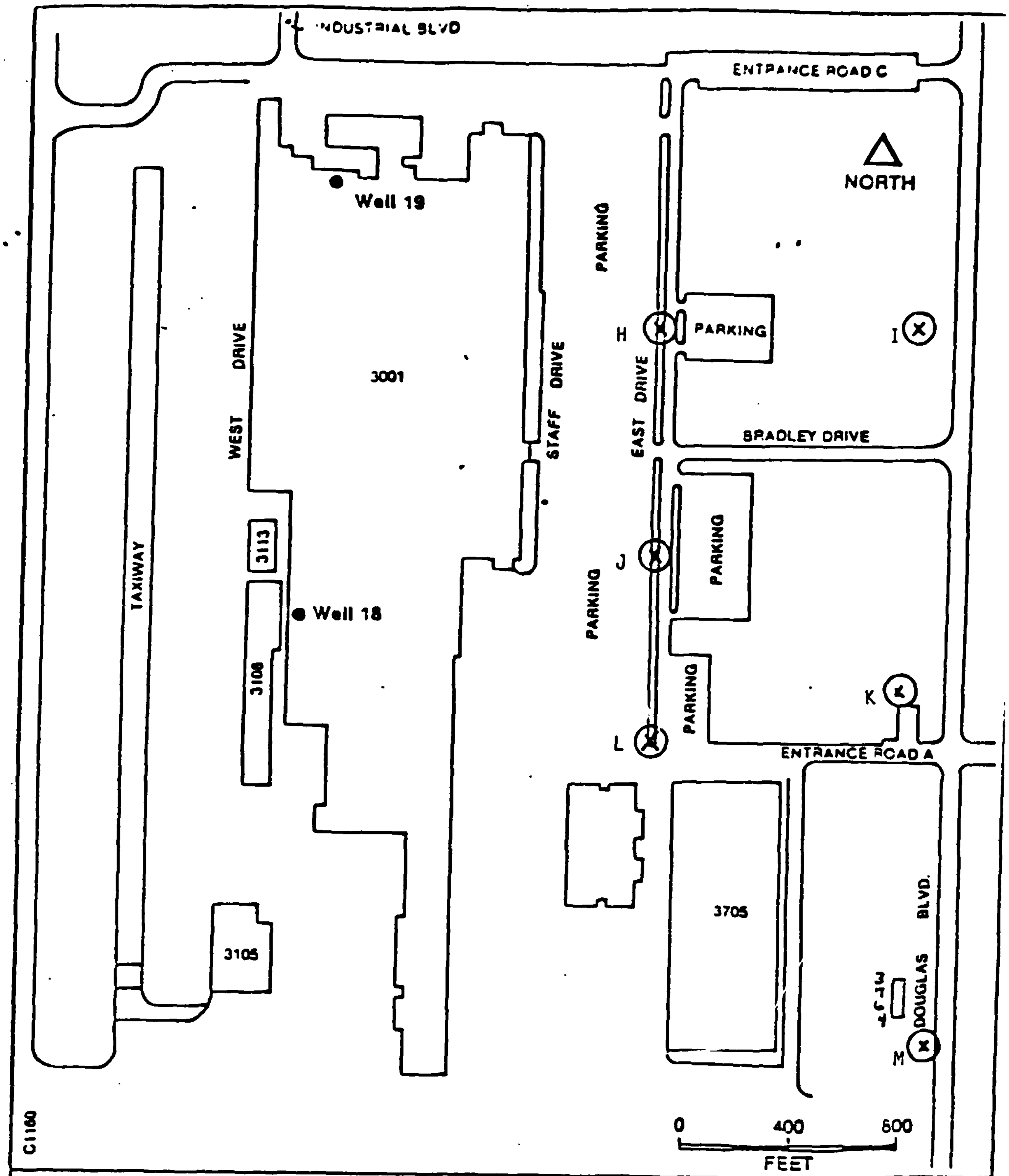


Figure 3-10. Zone 6 (Building 3001 Wells).

Atch 4

WELL	ELEVATION
WELL "A"	1277.73'
WELL "B"	1281.68'
WELL "C"	1272.30'
WELL "D"	1282.55'
WELL "E"	1280.99'
WELL "F"	1280.48'
WELL "G"	1300.00'
WELL "H"	1271.91'
WELL "I"	1256.15'
WELL "J"	1271.58'
WELL "K"	1270.22'
WELL "L"	1271.03'
WELL "M"	1287.29'

~~Atch 3~~

RADIAN CORPORATION

APPENDIX F

Sampling and Analytical Procedures

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Field Procedures

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QUALITY ASSURANCE

The bulk of the field sampling procedures were presented in Section 3.0 of the report. The purpose of this Appendix Section is to describe the quality control and quality assurance aspects of the field program.

Many of the traditional quality assurance techniques (duplicate or spiked samples, for instance) are designed to test instrument or analyst performance and do not address the needs of a field program of monitoring well installation. In lieu of such techniques, field practices are built around a principal of "do it right the first time", and procedures are developed to insure this. The three main elements of the field QA program are:

- Record-keeping;
- Peer review; and
- Technical staff management review.

Eash is discussed below.

Record-Keeping

Each supervising geologist kept field notes as the coring and well installation activities progressed. In addition, the drilling subcontractor's team chief also kept field notes. These two sets of notes were compared to develop the logs of drilling activities shown in Appendix D. Discrepancies were resolved by reference to the geologic samples collected.

Ground-water samples were collected in accordance with a written list. The servicing laboratory prepared sample containers and provided them to the field team, who were working from the same list. After the samples were logged into the laboratory, the log-in sheets were compared against the original analytical schedule. All samples were shipped or hand-carried to the laboratory, accompanied by chain-of-custody forms (Appendix G).

Peer Review

Each of the supervising geologists served overlapping tours of duty in the field. This provided all with the opportunity to participate in broad portions of the study, rather than focusing on a single zone. Each person overlapped with his successor to insure a smooth transition. Once the field effort was concluded, the supervising geologists were assigned to write up separate zones. These writing assignments provided for close coordination with other members of the field team, so that observations during drilling and sampling were incorporated into the text. After the drilling logs and report text were prepared, they were reviewed for completeness and accuracy by other members of the field team. Thus, each portion of the report was subjected to peer review before entering the formal review process.

Technical Staff Management Review

After the complete report was finalized by the Project Director, it was formally reviewed by a senior member of Radian's technical staff management. This review focused on quality of presentation and soundness of discussion and recommendations.

FIELD EQUIPMENT CALIBRATION

This program utilized very little in the way of field instrumentation. The four items of equipment were:

- pH meter (Corning Model 610A with a combination electrode), standardized daily against pH 7.00 and 10.00 or 4.00 buffers.

- Conductivity meter (YSI Model 33), calibrated before deployment against an 800 μmho standard and daily internal calibration check ("red line"):

- Water level probe (Soiltest Model 762A), no calibration required; and

- Threshold Limit Value Detector - "TLV meter" (Bacharach Model 23-7231), zeroed with organic-free air and spanned with hexane standards. Not used for emissions level data determinations, but only for field drilling safety.

RADIAN
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Laboratory Quality Assurance Program

Quality Assurance/Quality Control
Program
for
Radian Analytical Services

THE QUALITY ASSURANCE/QUALITY CONTROL PROGRAM FOR RADIAN ANALYTICAL SERVICES

Radian Analytical Services' (RAS) objective is to provide high quality chemical analyses to all clients regardless of the size of the analytical task. To aid in achieving this goal, a strong quality assurance program and rigid quality control practices are integral parts of all analyses. This document describes these quality assurance/quality control protocols for the Radian Analytical Services laboratories.

The basic quality control program includes procedures for sample handling, calibration, spiking and replicate analyses, analysis of QC test samples, equipment maintenance, and supplies control. These procedures can be integrated with a client's additional requirements, such as spiking studies, analysis of replicate samples, linearity determinations, and stability studies.

The quality assurance program consists of the frequent submission of blind QA samples, duplicates, and spiked sample splits. Also included are personnel training, analytical methodologies, sample control procedures, data handling, and equipment maintenance and calibrations.

1.0 QA Organization/Policy

The objective of Radian's quality assurance/quality control program is to assure, assess, and document the precision, accuracy, and adequacy of data obtained from chemical analysis and to assure the technical accuracy of the results obtained for all samples.

Radian has organized the quality assurance function within the company to allow complete independence of program review. Radian's Quality Assurance Director reports directly to the Vice President of the Technical Staff. This position provides independent reviews at all levels of the technical staff and laboratory organization and allows immediate access to Radian's top management on QA-related matters.

The QA Director's involvement may be limited to a review of quality control practices or as extensive as active development and implementation of quality control procedures and statistical data analysis. The QA Director may be asked to contribute expertise and assistance when a need is perceived by either the client, the technical staff, or the management staff.

Because of the large number of samples analyzed by RAS, a QA coordinator has been assigned to monitor and maintain an effective QA/QC program for these laboratories. The RAS Quality Assurance Coordinator, directly responsible to the Corporate QA Director, serves as an independent auditor of all RAS laboratories. The responsibilities of the RAS QA Coordinator are as follows:

- Monitor QA/QC within RAS laboratories,
- Supervise the preparation of blind audit samples,

- inform the Director of RAS and the corporate QA Director of quality assurance problems,

- summarize and report QA activities in the laboratories,

- document all QA and QC procedures within RAS,

- act as liaison between the corporate QA Director and RAS,

- provide QA data to the corporate QA Director for inclusion in the corporate QA reports.

The RAS laboratory managers function as the quality control coordinators in each particular analytical area. Their efforts are coordinated and monitored by the QA Coordinator.

Quality control coordinators serve as a focal point for all QC activities pertaining to each RAS laboratory. They work as a committee coordinated by the RAS Quality Assurance Coordinator. Their activities include the following:

- monitor the QA/QC activities of the laboratory area,

- inform the Director of Analytical Services and the QA coordinator of QC problems and needs.

- summarize, document, and report quality control activities and data generated in the laboratory,

- provide documentation of all QC procedures in the laboratory,

- maintains summaries of QC activities and data in a form suitable for client review upon request.

2.0 Quality Control for Laboratory Analyses

Radian Analytical Services has developed and implemented quality control procedures for all of the analyses performed in the laboratory. The laboratory quality control program provides an effective and efficient laboratory protocol for QC regardless of the size or scope of the analytical requirements. Approved analytical methods are used whenever available. When approved methods are not available, a method is developed by the Radian technical staff, and a technical note written describing the method. The quality control procedures are designed to insure that the standard operating procedures and quality control protocols are being followed and accurate results are obtained.

The general quality control program utilized in each laboratory includes consideration of the following areas:

- personnel training and certification,
- analytical methodology documentation,
- sample handling and control,
- laboratory facilities and equipment,
- calibration and standards,
- data handling and documentation,
- quality control check samples,

The general approach to quality control in each of these areas is discussed in the remainder of this section.

2.1 Personnel Training and Certification

The successful implementation of any QA/QC program is determined by the training and dedication of the laboratory personnel. The quality and consistency of data should be independent of the analyst. With the proper training and supervision, an analyst will be able to obtain quality data by the use of proven methodology. Periodic assessment of training requirements and certification are performed to maintain a high level of laboratory awareness.

The training and certification methods employed in the RAS laboratories are briefly described below:

- study of laboratory standard operating procedures,
- study of QA manual,
- observation of experienced operators/analysts,
- study of operating manuals,
- instruction by the laboratory manager on all aspects of the analysis,
- perform the analysis under the direct supervision of the laboratory manager,
- perform analysis under supervision of experienced personnel,
- analysis of blind QC samples prepared by laboratory QC coordinator,
- participation in in-house seminars on laboratory methods and procedures.

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PERSONNEL TRAINING RECORD

Employee ____________________

Employee Number ____________________

Date of Employment ____________________

Laboratory Orientation:

Upon completion of each phase of personnel training the employee and Laboratory Manager will initial and date the step completed.

- The RAS laboratory Standard Operating Procedures have been read and understood.

  Employee ________ Lab Mgr. ________ Date ________

- The RAS Quality Assurance manual has been read and the procedures for the laboratory in which the employee worker have been explained.

  Employee ________ Lab Mgr. ________ Date ________

- Operation manuals for instruments with which the employee performs analyses have been studied and the procedures for operation and maintenance are understood.

Instrument	Employee	Lab Mgr.	Date	Instrument	Employee	Lab Mgr.	Date

Figure 2-1.

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Test Specific Training:

Each specific test performed in the RAS laboratories involves procedures which may be unique. The steps involved in training an employee are:

- Instruction by the Laboratory Manager on all aspects of the analysis,
- Observation of experienced operators/analysts,
- Perform the analysis under supervision of the laboratory manager,
- Perform analysis of QA samples submitted by the QA coordinator, and
- Participation in in-house seminars on laboratory methods and procedures.

The following table is to be completed by dating and initialing by the employee and Laboratory Manager upon completion of each step.

Method	Instruction	Observation	Perform the Analysis	Analysis of QA samples	Seminars

Figure 2-1. (Cont'd)

All RAS personnel must complete a quality control training program. This system includes motivation toward producing data of acceptable quality and involves "practice work" by new employees. New personnel are made aware of the quality standards established by RAS and the reasons for those standards. They are made aware of the various ways of achieving and maintaining quality data. After an employee has been trained to use a method and the work validated by the laboratory manager, the employee is certified to perform the analysis. As these people progress to higher degrees of proficiency, their accomplishments are reviewed and then documented. Documentation of proficiency training is maintained by the QC Coordinator for each laboratory technician using the two-page form shown in Figure 2-1.

2.2 Analytical Methodologies

All analytical procedures followed in the RAS laboratories are documented in a methods manual for the specific laboratory. A set of standard operating procedures (SOP) has been established for each analysis to insure consistency. Most methods used are directly from an approved analytical manual, e.g., EPA methods, APHA Standard Methods for Water and Wastewater, ASTM, etc.

Methodologies may contain the following information:

- method title,
- scope of method,
- summary of interferences, and applications,
- concentration ranges and detection limits,
- safety precautions,
- required equipment and materials,
- standardization directions,
- detailed analytical procedure,
- calculations, with examples,
- reporting method,
- precision and accuracy statement,
- references.

2.3 Sample Control and Record Keeping

The Radian Analytical Services Sample Control Center is a controlled access area. Only employees of the Sample Control Center have access to sample receiving, sample storage, documentation files, and the computer terminals. Analysts check out samples under the supervision of the sample control personnel. All samples are stored in locked storage areas. Sample tracking is maintained by a computerized laboratory management system and a sample checkout logbook. The RAS Sacramento laboratory is linked to the central processing unit of the computer in Austin via a dedicated phone line. This insures that the laboratories are in constant communication. All sample information and data entries can be immediately accessed at either location.

Detailed record keeping and control of samples are essential for effective laboratory operation. All samples received for analysis in the Radian Analytical Service laboratories are processed through the Sample and Analysis Management System (SAM). Radian Corporation's SAM is a software and hardware system for controlling and handling information for the analytical laboratory. SAM provides a dynamic, easy-to-use method for tracking, scheduling, reporting, and laboratory management. The system has been designed to accommodate and promote good laboratory management practices by providing high visibility of the information laboratory managers need to make good decisions regarding schedules and priority. The system is designed around a Data General Nova-IV computer with a 64K-byte memory. It also includes a 65M-byte disk drive and a line printer with plotting capabilities. Data is entered via a TEC terminal and CRT. All data stored on the disk is backed up on magnetic tape to prevent loss in the event of a system malfunction. The system is designed so that an individual designated as the principal operator can process the required paperwork for a large laboratory with little difficulty. The approach centralizes information input and data retrieval, and provides the mechanism for organized, up-to-date laboratory performance monitoring.

SAM maintains complete client information files, generates laboratory status reports, flags sample analyses which are overdue, accepts analysis results manually or automatically, and generates reports and invoices.

The Sample Control Center and SAM have six basic functions:

- sample receipts and logging,
- sample storage and maintenance of sample integrity,
- laboratory status reporting,
- document control,
- data compilation and reporting, and
- invoicing.

In order to assure the integrity of a sample and the accompanying documentation, a security plan has been established. This plan consists of three parts:

- chain of custody,
- secured refrigerated storage, and
- document control.

The progression of samples and documentation through the Sample Control Center and the analytical laboratories is presented in Figure 2-2. Detailed descriptions of each sample control function are presented below:

- Samples are received from the commercial carrier at Radian's shipping and receiving facilities by the receiving clerk.

- Within one hour of arrival, the samples are accepted by RAS sample control personnel.

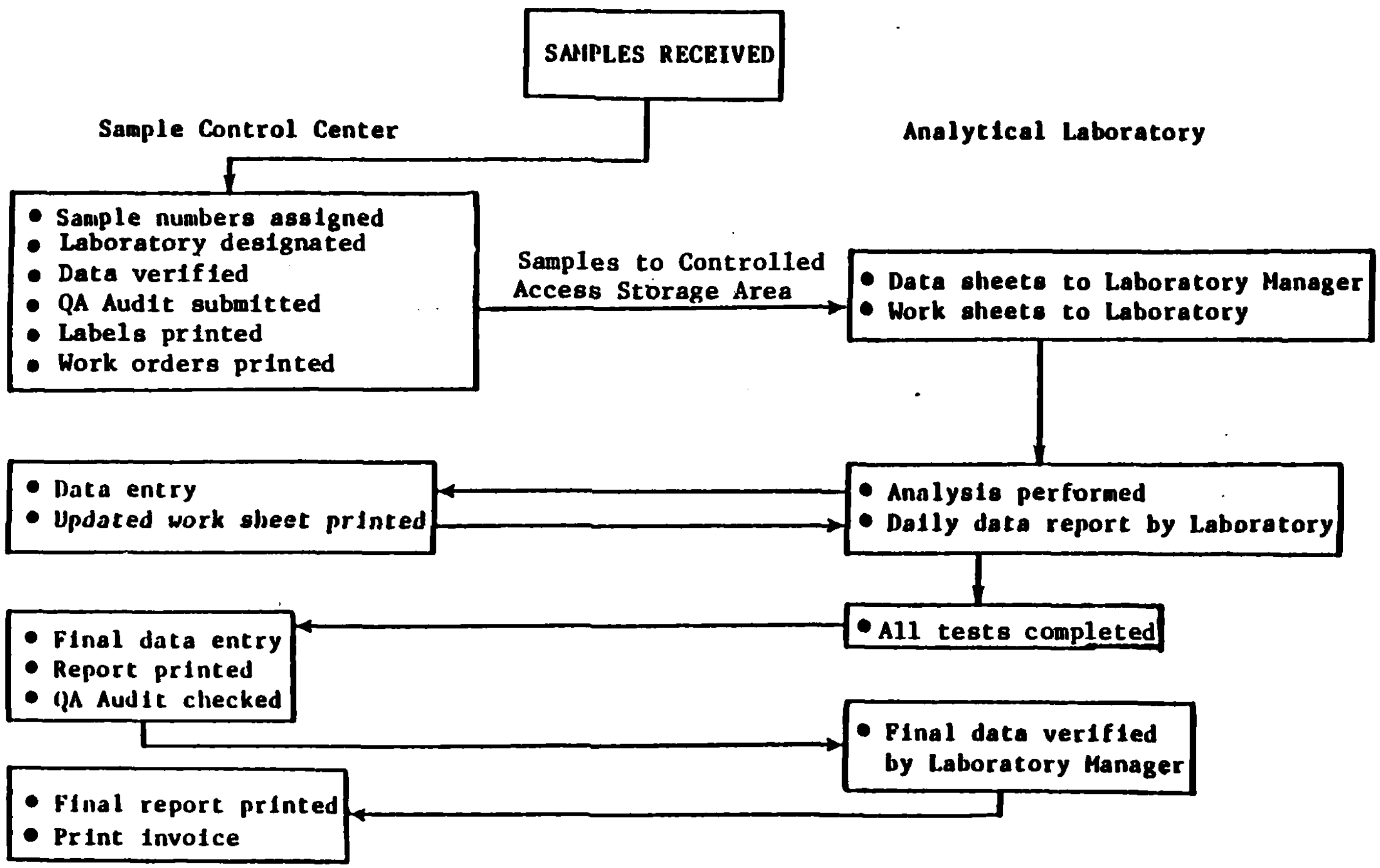

Figure 2-2. SAM Laboratory Management System

- All shipping containers and security seals, when appropriate, are inspected for physical damage or evidence of tampering.

- The samples are unpacked in the sample receiving area by the RAS sample custodian. The method of shipment, shipping container integrity, condition of samples, the number of samples/container, integrity of the security seal, and accompanying documentation are noted. Sample identification is verified against custody documents. The enclosed chain-of-custody forms, Figure 2-3, when required, are completed and filed with the shipping and receiving documentation. In the event that peculiarities are noted, the project officer or client is immediately advised of the irregularity.

- Samples are logged into a bound sample logbook, Figure 2-4. Again, sample identity is verified. All discrepancies are noted in the logbook.

- The handwritten logbook and all documentation are transferred to the Sample Control Center.

- The samples are logged into the SAM system. Each batch of samples is assigned a consecutive work order number by the system. Analytical requirements for each sample are entered into the computer.

- Hard copy of the work order and other information is printed and filed with the received documentation in the Sample Control Center.

- Labels are printed and secured to each sample. Label information includes sample number, identification, storage location, and analytical requirements.

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CHAIN OF CUSTODY RECORD

Field Sample No. ________

Company Sampled/Address ________
Sample Point Description ________

Stream Characteristics:
Temperature ________ Flow ________ pH ________
Visual Observations/Comments ________
____

Collector's Name ________ Date/Time Sampled ________
Amount of Sample Collected ________
Sample Description ________
Store at: ☐ Ambient ☐ 5°C ☐ −10°C ☐ Other ________

☐ Caution - No more sample available ☐ Return unused portion of sample ☐ Discard unused portions

Other Instructions - Special Handling - Hazards ________
____
____

☐ Hazardous sample (see below) ☐ Non-hazardous sample

☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive

☐ Other ________

Sample Allocation/Chain of Possession:
Organization Name ________
Received By ________ Date Received ________ Time ________
Transported By ________ Lab Sample No. ________
Comments ________
Inclusive Dates of Possession ________

Organization Name ________
Received By ________ Date Received ________ Time ________
Transported By ________ Lab Sample No. ________
Comments ________
Inclusive Dates of Possession ________

Organization Name ________
Received By ________ Date Received ________ Time ________
Transported By ________ Lab Sample No. ________
Comments ________
Inclusive Dates of Possession ________

Figure 2-3. Chain or Custody Record

RADIAN
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Lab No. ________

Company ______________________
Facility ______________________
____
Rep ______________________
Phone ______________________
Report ______________________
to ______________________
____
____
Attn ______________________
Inv ______________________
to ______________________
____
____
Attn ______________________
P.O. # ______________________
Expires ______________________

Quoted $ ________
Sample $ ________
Misc $ ________
Total $ ________
Inv by (CPR) ________
% Surcharge ________
% Disc: All ________

Contact ________
Received ________
Date Due ________
Samples ________
Keep for ________
Keep til ________
Disp (RD) ________

Reports ________ # Invoices ________

Work ID ______________________
Taken ______________________
Trans ______________________
Type ______________________
Condition ______________________
Comments:

Location: ________________

Dash No.	Sample Description	Analysis Required	QA

Figure 2-4. Sample Log Sheet

- Data sheets and work sheets are printed for each batch of samples and distributed to the appropriate laboratory managers. The work sheets list sample numbers, sample identification, storage location, and analytical requirements. Data sheets are for results and contain only the parameters to be determined by a given laboratory.

- Following sample logging, the samples are placed in the designated locked storage area.

- Subsequent sample custody is documented and all transactions witnessed by sample control personnel.

- The analyst retrieves the samples from the Sample Control Center by sample number and storage location.

- The Sample checkout log (Figure 2-5) is completed by the analyst, noting the laboratory to which the sample is being removed.

- After analysis, or when the required aliquot is removed, the sample is returned to the Sample Control Center and return is noted in the sample checkout log.

- The sample is returned to the designated storage location.

- When requested, addition chain-of-custody documentation can be provided using a SAM-generated document (Figure 2-6). This document can be retained by sample control to provide a more easily retrievable record of sample custody within the analytical laboratory.

- The sample is stored until the assigned time or written permission is given to either properly dispose of or return the sample to the client.

RAS SAMPLE CHECK OUT LOG

WORK ORDER	SPLITS REMOVED	CHECK-OUT INFORMATION				RETURN INFORMATION		
		DATE	TIME	DESTINATION	INITIALS	DATE	TIME	INITIALS

7S/196 (Water and Prep. Labs)

7S/194 (Extraction & Water Labs

7S/180 (ICP and AA Labs)

7S/191 (TOX, TCC)

7S/195 (Technician)

7S/171 (GC)

Figure 2-5. Sample Checkout Log

RADIAN

PAGE 1 Analytical Serv CHAIN OF CUSTODY LAB # 83-02-A67

RCVD: 02/26/83 DUE: 03/19/83 04/21/83 09:56:49 KEEP: 05/09/83 DISP: D

DASH	SAMPLE IDENTIFICATION	LOCATION	TESTS						
01A-B	Number 001	Ref 2	CAUSTY	CO3_A	HARD_B	HCO3_A	MHO_A	ONG_A	PH_A
			PO4_B	SO3_TA	TANNIN				
02A	Number 002	Ref 2	ACFS						
02B	Number 002	Ref 2	ICP_40						
03A	Super soil	Ref 2	ANFS						
04A	Boiler scale 222	Ref 2	CA_E	CL_TA	CO3_A	FE_E	HCO3_A	MG_E	NA_E
			P_E	SO4_NA	S_E	ZN_E			
05A	Sample AV56	Shelf 13	B_MET	C_MET					
06A	Water #164	Ref. 023	AG_E	AS_HA	BA_E	CD_E	CR_E	FE_E	HG_CA
			MN_E	NA_E	PB_GA	SE_HA			
06B	Water #164	Ref. 023	CL_TA	F_SIEA	MHO_A	NO3_A	PH_A	SO4_NA	TDS_A
06C	Water #164	Ref. 023	H1RCRA	P1RCRA					
06D	Water #164	Ref. 023	ALPHA	BETA	RA_TOT				

RECEIVED BY	DATE	RETURNED TO	DATE	FRACTION NUMBERS.

Figure 2-6. Laboratory Chain of Custody

- All documentation, including shipping documents, field sampling documents, computer-generated log sheets, chain-of-custody forms, laboratory data sheets, final computer reports, and other documents, are maintained in the sample control area. All reports are kept in locked filing cabinets. As with the sample storage area, the document storage area is limited-access.

All storage areas are within the Sample Control Center and are locked when not in use. Access to the storage area is limited to sample control personnel or other RAS employees accompanied by sample control personnel. There are four storage locations that are used depending on the sample and the required analyses. They are:

- ambient storage for samples that do not require refrigeration,
- $4^{\circ}C$ storage for most samples requiring water quality analysis and extractable organics,
- $4^{\circ}C$ storage for samples requiring volatile organic analysis, and
- $-20^{\circ}C$ storage for extracts and samples that require freezing.

A temperature log is maintained to monitor the cold storage facilities.

2.4 Laboratory Facilities and Equipment

A clean well-lighted, and well maintained laboratory is essential for accurate analytical results. Each laboratory is well-lighted, air conditioned and equipped with chemical fume hoods. Instrumentation that may emit noxious odors is vented externally.

Quality Control of Equipment and Supplies

Each laboratory QC program includes detailed requirements for equipment and supplies. Reagents, solvents, and standards with specific levels of purity are used as specified by the analytical protocol. Specific GC column materials, glassware and sample handling equipment are also specified. The quality control procedures for equipment and supplies generally include the following items:

- operator checklists for required supplies,
- documentation and reporting of all deviations from specified instrument performance,
- procedures for testing for purity of reagents,
- tolerances for calibrated glassware where applicable,
- monitoring of refrigerated storage space,
- maintenance logbooks,
- service contracts on analytical instrumentation.

Quality control procedures during sample preparation include the preparation of reagent or solvent blanks. Additional quality control techniques implemented in sample preparation include:

- deionized water piped into all laboratories, monitored daily,
- purchasing high purity distilled-in-glass solvents in large quantities from a single lot,

- use of Ultrex acids in trace metal digestion,
- cleaning of organic glassware with chromic acid or firing in a kiln at 450°C,
- cleaning of trace metal glassware with nitric acid,
- use of organic-free water prepared at Radian by distillation over alkaline permanganate under nitrogen atomsphere in all-glass still,
- use of volatile-free water prepared by purging organic-free water with nitrogen,
- sample preparation performed by experienced technical personnel under the supervision of senior level analysts.

2.5 Quality Control for Standards and Calibration

The quality of all test results is greatly impacted by the calibration procedures used. Calibration procedures and standards should be specified for all equipment and supplies used in the test procedure. Traceability to common standards is essential for test procedures to be used in multiple laboratories. Quality control procedures for standards and calibrations include the following considerations:

- written, detailed calibration instructions,
- preparation procedures for secondary standards, when applicable,
- requirements for frequency of calibration,
- recordkeeping of all calibrations and standards used,

- quality control charts for recording results from multiple calibrations,
- evaluation of internal standards, and
- tolerances for calibration requirements.

All calibration standards are prepared from NBS-traceable, EPA certified, or primary standard materials. Daily logs are maintained to monitor instrument response to a given standard.

Quality Control Test Samples

Routine quality control samples to be analyzed concurrently with client samples are a significant portion of the RAS laboratory quality control programs. The purpose of these checks is twofold: 1) to assure that samples being analyzed satisfy predetermined standards of accuracy, and 2) to measure and document achieved levels of accuracy and precision.

There are many different types of quality control samples which could be used for these purposes. The correct combination of these will depend on the complexity of the test method and the desired degree of accuracy. The following quality control parameters are general considerations for Radian's quality control for test methods.

Interferences

The analytical results of a test method might be affected by interferences from the glassware, solvents, reagents, or the sample matrix. Blank samples which are subjected to conditions similar to samples being analyzed are used to evaluate the purity of laboratory reagents. The frequency of blank analysis is method dependent. For example, a laboratory or field blank is analyzed after each GC/MS volatile organic analysis with high levels for any of the pollutants. Ten percent of the samples from a

given sample batch are spiked with a known standard. Spike recovery data are calculated to determine matrix interference.

Precision

The precision or repeatability of a test method is required for proper interpretation and weighting of the data. Replicate samples or standards are used to determine the precision on a regular basis. The precision of multiple analyses are compared against predetermined precision limits to determine their acceptability. The precision is usually reported as a standard deviation or repeatability statistic and often depends on the concentration of the parameters analyzed. Replicate analyses are defined as separate digestions or extractions of the same sample, when possible. The percentage difference or range between replicate analyses is also used to monitor precision.

Reproducibility

The reproducibility of a test method refers to the repeatability over a period of time. How well will analytical results repeated a month later agree with today's results? Reproducibility can be measured by the repeated analysis of samples from a previous time period or by analysis by more than one laboratory or laboratory technician.

Qualitative Specificity

In the analysis of complex sample matrices containing multiple components, the use of a single method can lead to misidentification of compounds. The misidentification can be detected by repeated analysis of standards containing the compounds of interest or by independent analysis by a more specific method. For example, mass spectral confirmation can be used to evaluate misidentification problems in the GC laboratory.

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2.6 Documentation and Data Handling

Documentation of methods, procedures, and results is an essential aspect of a QA/QC program.

Adequate documentation is required for an instrument maintenance system. RAS laboratories use an individual logbook, which is kept at each instrument, to record all calibration and maintenance activities. This logbook gives a chronology of that instrument's installation, operation, calibrations, maintenance, malfunction, and repairs. An accompanying binder includes all pertinent manufacturing information, service manuals, and similar reference materials.

Directions for calibrations and maintenance, along with appropriate forms and checklists, are maintained in a manual accompanying the logbook. The directions specify the required frequency for calibrations and maintenance, the tolerances for calibrations, and the action to be taken when calibration requirements are not met.

In this system, there is a single source for reference purposes as well as record keeping. All the instrument logbooks are reviewed periodically by the quality assurance coordinator and laboratory manager. A record of these logbook checks is maintained by the QA coordinator.

Work sheets have been developed to insure consistent laboratory data entry for most parameters determined in the laboratories. These sheets are designed to organize the data in a clear and logical manner, and to simplify calculations. The work sheets are divided into various sections including a section for reporting calibration standards and blank values and a section for plotting calibration curves. These work sheets are usually a standard data entry form which the laboratory technician enters in his/her bound lab notebook. When automated calibration is not applicable, electronic calculators are available in the laboratories to generate calibration curves by the method of least squates. Thus errors in reading calibration curves and calculating data are minimized. After an analysis

is completed and a data sheet filled out, the laboratory manager checks the data for completeness and approves the data sheet. After the data have been entered into the SAM system, an updated data sheet is issued to the laboratory manager. When the work is complete, a preliminary report is printed and distributed to the contributing laboratory managers for the final data check and approval. A final report is printed, certified by the laboratory manager, and forwarded to the client.

Proper documentation of quality assurance and quality control activities is an essential requirement. Documentation is needed to demonstrate that quality control activities were completed as scheduled and to communicate the results of the QC tests to laboratory managers and clients. Documentation of QA results is required to provide feedback for improvement of quality control programs.

Quality control documentation should be timely in order for feedback to occur. Daily reporting to laboratory managers is mandatory. Forms are designed to organize the QC data in a clear and logical manner, and to simplify calculations. Control charts are another excellent tool for summarizing quality control test results.

As part of Radian's QA audit program weekly reports summarizing audit results in the laboratories are prepared and distributed to QC coordinators.

3.0 Quality Assurance Audits

The quality assurance audit program of the RAS laboratories is conducted by the RAS QA Coordinator in conjunction with the corporate QA Director. The program consists of the following:

- QA standards are prepared using EPA certified standards, NBS standards, primary standard materials, and NBS-traceable compounds. All standards preparations are recorded in the QA Sample logbook (Figure 3-1).

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CORPORATION

Standard No. QAS ____________

QA type ________________________

Prep date ____________ Prepared by _______________ Verified by ____________

Standard source ____

____

Sample matrix ____

Parameters

________	________	________	________	________
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________
________	________	________	________	________

Preparation method

Final vol ____________

Figure 3-1. Standards preparation logbook

RADIAN CORPORATION

QAS ______________

Prep method (con't)

Calculations

Sample Distribution

Date	SAM No.	Client	Remarks

Figure 3-1. (Cont.)

- An inventory of stock standards is maintained within the limits of published stability data. This decreases the time required for daily standard preparation.

- Duplicate samples are requested from clients. These are blind to the laboratory and the client is not billed for the duplicate.

- Blind QA samples are submitted through the Sample Control Center to all laboratories. The parameters and concentration levels are selected by the RAS Quality Assurance Coordinator.

- Laboratory managers submit, via a "QA Alert Form" (Figure 3-2). a list of the types of QA samples needed the following week. This insures that the parameters with which there have been problems are included in the sample.

- Monthly reports are issued from the RAS QA Coordinator (Fig. 3-3). These are submitted to the corporate QA Director, laboratory managers and Director of RAS. Managers are notified immediately of major problems with the results of analysis of a QA sample.

- The results of the program are summarized on a quarterly basis for Radian's management.

In addition to the continuous audit program, provisions for third party review are made with each client's work. Radian Analytical Services welcomes onsite audits, performance samples, and independent evaluations.

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QA ALERT FORM

QA standard for the week of ____________

NPDES
- Form A water __
- Form B water __
  - metals __
- Form C water __
  - metals __
  - organics __

RCRA metals __ anions __

pesticide OC __ OP __ herbicide __

EPA 601 __ 602 __ 624 __ 625 __

B/N __ Acids __ A/N __

TOC __ TOX __

MS VOA __ GC VOA __

PCB __

Matrix requirements: ____________

Concentration requirements: ____________

Special Standards/Instructions	Individual Parameters

Date ____________ Mgr ____________

Figure 3-2. QA alert form

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CORPORATION

ANALYTICAL SERVICES
MONTHLY QA REPORT

QA prep report for the month of ______________

Order No.	Lab	Parameter	Certified Value	Analyzed Value	% Recovery	Date Reported

Figure 3-3. Monthly QA Report

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3.1 Data Review and Validation

All analysis results are entered into the SAM computer system. Following completion of the analyses, a preliminary report is printed and returned to the appropriate laboratory manager for review and validation. A final report is printed after the certification by the manager. This report is signed and approved by the laboratory manager before being forwarded to the client. The following diagram (Fig. 3-4) illustrates the data flow for a typical sample analysis.

Upon completion of the analysis and before the final data are issued, the results of the QA audit samples are compared to the certified values. These results are plotted on control charts. Separate control charts are maintained for each analysis. If results are outside the accepted control limits, the analytical results are held until the problem is resolved.

3.2 Control Charts

Quality control charts are maintained for both accuracy and precision. Both charts are structured as shown in Figure 3-5. The main portions of the chart are the center line and the two control limits. The center line is the 100% or total recovery/total agreement of analytical results. The upper and lower control limits are calculated from historical data.

Control charts for accuracy are constructed as follows:

Precent recovery of standards (P_{ST}):

$$P_{ST} = 100 \times \frac{\text{analyzed value}}{\text{certified value}}$$

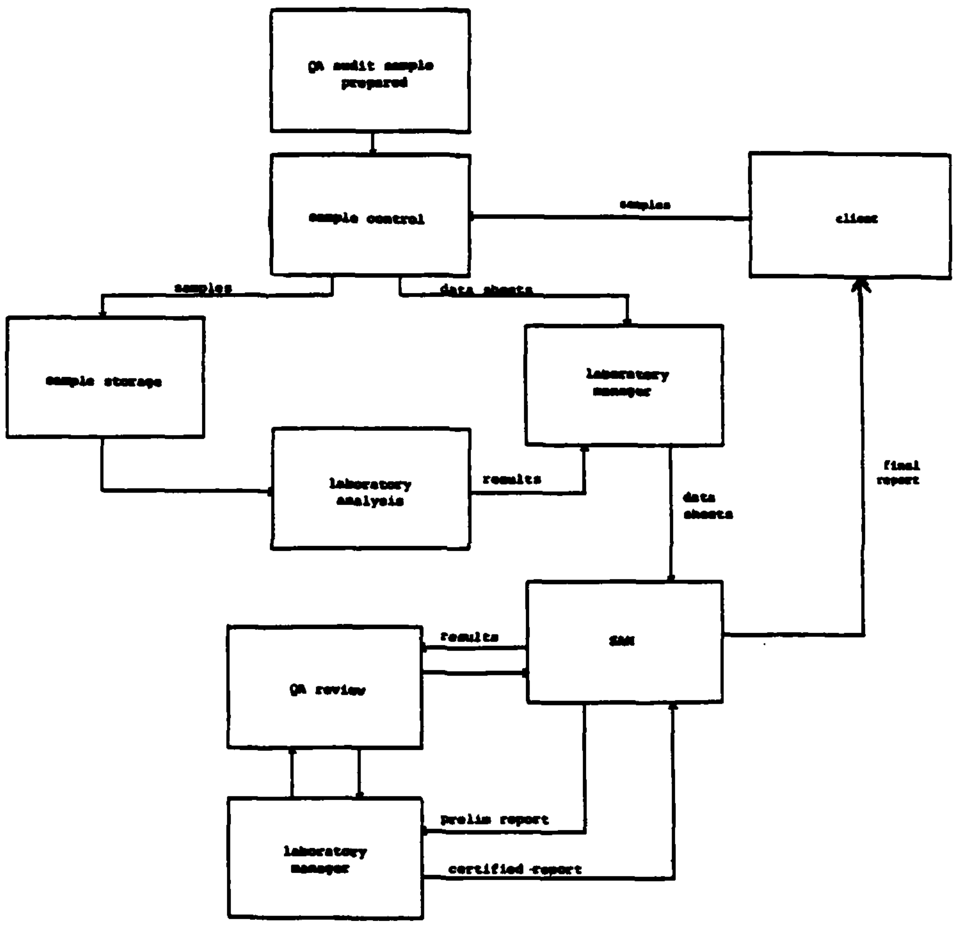


Figure 3-4. Data Flow

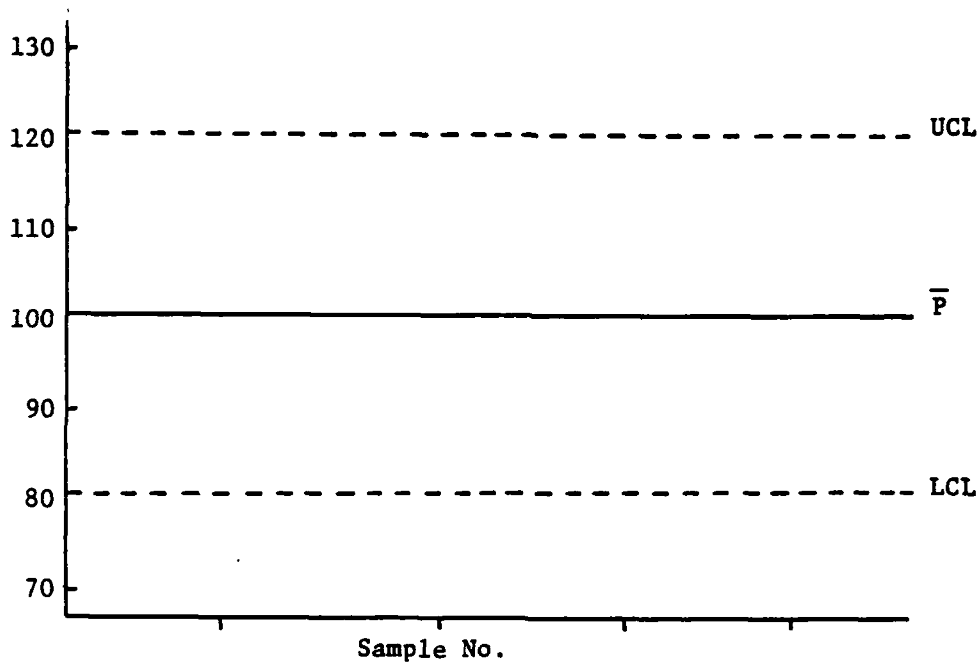


Figure 3-5. Control Chart

Percent recovery of spikes in samples (P_{SP}):

$$P_{SP} = 100 \times \frac{\text{analyzed value - background value}}{\text{spike}}$$

From a set of analyses, the average percent recovery ($\overline{P}$):

$$\overline{P} = \frac{\sum_{i=1}^{n} P_i}{n}$$

The standard deviation for percent recovery (S_R):

$$S_R = \sqrt{\frac{\sum_{i=1}^{n} P_i^2 - \left(\sum_{i=1}^{n} P_i\right)^2 / n}{n-1}}$$

The upper and lower control limits are therefore

$$UCL = \overline{P} + 3S_R$$
$$LCL = \overline{P} - 3S_R$$

An analysis is out of control when either of the two conditions apply:

1) Any results outside the control limits
2) Seven successive results on the same side of the control line.

Control charts for precision are also constructed. Precision is a function of the concentration range of the analyte. The closer the result is to the analytical detection limit, the more imprecise the data become on a percentage scale. Figure 3-6 illustrates the relationship between detection limit and precision for a typical methodology. Because of this concentration dependence, precision control charts need to be developed for specific concentration ranges for each analyte. For duplicate samples A and B, the ratio of the values of A and B are plotted.

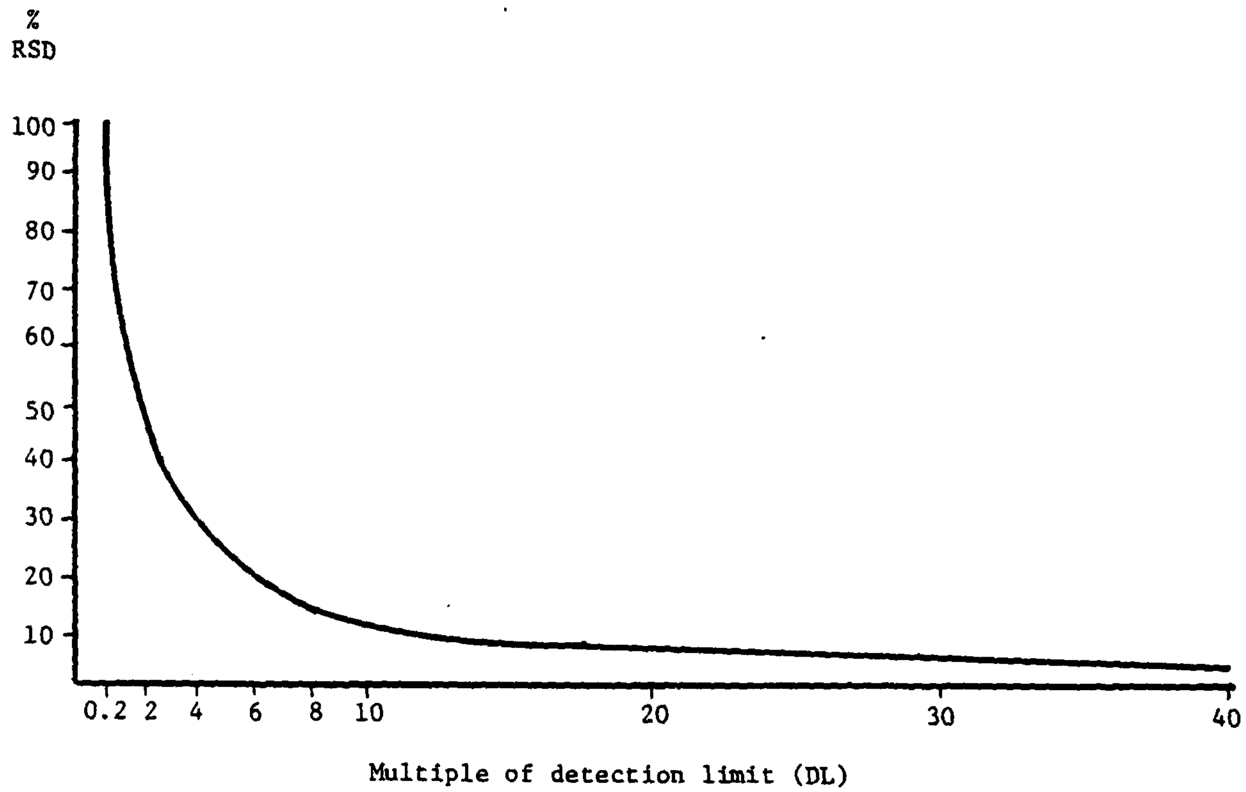


Figure 3-6. Relationship between Detection Limit and Precision

3.3 Concurrent Review

Upon review of analytical results of QA audit samples, the QA Coordinator will schedule a meeting with the laboratory manager if there are any tests out of control or which are deviant from an expected precision/accuracy norm. The purpose of this meeting is to:

- review raw data and determine if there is an explanation for the deviance.

- outline analyses of quality control and/or quality assurance samples to further define the problem and its solution.

- establish a schedule for monitoring the analysis after a solution is implemented, to assure that the problem does not recur.

Involvement of the laboratory manager in the problem assessment and solution is essential to a mutual committment to a quality analytical laboratory.

APPENDIX G

Chain of Custody Forms

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-01

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION North side culvert under Patrol Rd - 150' E of Pond Rd.

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS SANDY Red Clay Sediments

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 19 June 84 1040

AMOUNT OF SAMPLE COLLECTED 1 L

SAMPLE DESCRIPTION Sandy red clay sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS None

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY Jane Lindsey DATE RECEIVED 6-20-84

LAB SAMPLE NO. 8406166-01 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED 02

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Crutcho Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS 1" flow. Flat bottom creekbed. Gravel bottom.

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 4/19/84 1100

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Composite of 3 12" deep plugs

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER ____

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS ____

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER ____

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6-20-84

LAB SAMPLE NO. 84C6166-02 COMMENTS ____

INCLUSIVE DATES OF POSSESSION ____

ORGANIZATION NAME ____

RECEIVED BY ____ DATE RECEIVED ____

LAB SAMPLE NO. ____ COMMENTS ____

INCLUSIVE DATES OF POSSESSION ____

ORGANIZATION NAME ____

RECEIVED BY ____ DATE RECEIVED ____

LAB SAMPLE NO. ____ COMMENTS ____

INCLUSIVE DATES OF POSSESSION ____

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE No. TSED-03

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Crutcho Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Level bottom stream.

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 6/19/84 1120

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Red clayey sediment. 3 plugs from composite sample

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-20-84

LAB SAMPLE No. 8406166-03 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-04

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION CRUTCHO CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS STREAM CHANNEL ROUGHLY VEE SHAPED.

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/19/84 1140

AMOUNT OF SAMPLE COLLECTED 1 ℓ

SAMPLE DESCRIPTION COMPOSITE FROM WATER'S EDGE. 50' UPSTREAM TOWER RD.

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-20-84

LAB SAMPLE NO. 8406166-04 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE No. TSED-05

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION CRUTCHO CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS STREAM CHANNEL ROUGHLY VEE SHAPED

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/19/84 1150

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION COMPOSITE FROM WATER'S EDGE

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE
☐ OTHER		

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6 20 84

LAB SAMPLE No. 8406166-05 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE No. TSCD-06

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION TRIBUTARY TO ELM CREEK. DRY CREEKBED

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS CREEKBED DRY.

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/19/84 1300

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION COMPOSITE OF 1 12" PLUG.

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6-20-84

LAB SAMPLE No. 8406166-06 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE No. TSED-07

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Crutcho Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Urban trash in creek.

COLLECTOR'S NAME Gaucarz DATE/TIME SAMPLED 6/19/84 1811

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY 440 Jane Lindsey DATE RECEIVED 6-21-84

LAB SAMPLE No. 4406190-01 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED -08

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Crutcho Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Near youth center foot bridge

COLLECTOR'S NAME Gaucarz DATE/TIME SAMPLED 6/19/84 1830

AMOUNT OF SAMPLE COLLECTED 1l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS -

RECEIVED BY [signature] DATE RECEIVED 6-21-84

LAB SAMPLE NO. 8406190-02 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED -09

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Khulman Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Gravel bottom. Jet fuel odor.

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 6/19/84 1845

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6-21-84

LAB SAMPLE NO. 8406190-03 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-10

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Khulman Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Creekbed to Bedrock. Odor of jet fuel

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 6/13/84 1930

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-21-84

LAB SAMPLE NO. 3406190-04 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-11

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Soldier Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Upstream of V-notch wier

COLLECTOR'S NAME Gamarz DATE/TIME SAMPLED 6/20/84 10:00

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Black sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-21-84

LAB SAMPLE NO. 8406190-05 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE No. TSED-12

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Soldier Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Gravel bottom. Just upstream of B-C-Weir

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 6/20/84 1030

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Red Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-21-84

LAB SAMPLE No. 8406140-06 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE No. TSED-13

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Soldier Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS 50' downstream of culvert

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 6/20/84 1100

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE
☐ OTHER		

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-21-84

LAB SAMPLE No. 8406190-07 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-14

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Confluence @ Soldier Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Upstream of STP

COLLECTOR'S NAME Goucarz DATE/TIME SAMPLED 6/20/84 1130

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Red, Silty Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6-21-84

LAB SAMPLE NO. 8406190-08 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-15

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Soldier Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Rectangular narrow channel.

COLLECTOR'S NAME Gaucerz DATE/TIME SAMPLED 6/20/84 1200

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-21-84

LAB SAMPLE NO. 8406190-08 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-16

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Soldier Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Boulder stream creek

COLLECTOR'S NAME Gaucerz DATE/TIME SAMPLED 4/20/84 1240

AMOUNT OF SAMPLE COLLECTED 0 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RDS

RECEIVED BY Jane Lindsey DATE RECEIVED 6-21-84

LAB SAMPLE NO. 840619010 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-17

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Area D

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Channel dry

COLLECTOR'S NAME Gawcarz DATE/TIME SAMPLED 6/20/84 1300

AMOUNT OF SAMPLE COLLECTED 4 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-21-84

LAB SAMPLE NO. 840690-12 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED 18

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Soldier Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS None

COLLECTOR'S NAME Gaucarz DATE/TIME SAMPLED 6/20/84 1400

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE
☐ OTHER		

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY Jane Rudzey DATE RECEIVED 6-21-84

LAB SAMPLE NO. 8406190-11 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-19

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Crutcho Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Much foam downstream of weir

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 6/20/84 1630

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS -

RECEIVED BY [illegible signature] DATE RECEIVED 6-22-84

LAB SAMPLE NO. 8406206-01 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE No. TSED-20

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION CRUTCHO CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Oil film on surface

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 0720

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE
☐ OTHER		

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-22-84

LAB SAMPLE No. COMMENTS [illegible]

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED21

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Crutcho Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS NEAR LANDFILL

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 0800

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6-22-84

LAB SAMPLE NO. 8406206-02 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-22

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION CRUTCHO CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS BEAVER DAM

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 0900

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY Jane Welda DATE RECEIVED 6-22-84

LAB SAMPLE NO. 3406206-03 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

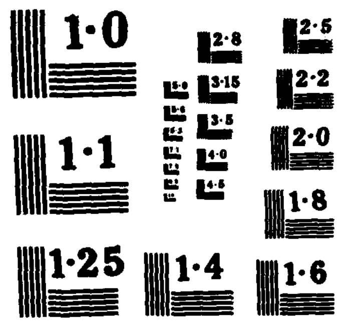
RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

AD-A162 911 INSTALLATION RESTORATION PROGRAM PHASE II CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN TX R W BAUER ET AL. OCT 85 RAD-85-212-027-21-03-VOL-2 3/6

UNCLASSIFIED F33615-83-D-4001 F/G 13/2 NL


1·0
2·8
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3·5
2·0
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4·0
4·5
1·8
1·25
1·4
1·6

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED 23

COMPANY SAMPLED/ADDRESS Tinker AFB

SAMPLE POINT DESCRIPTION Crutcho Creek

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS Odor of Phenol

COLLECTOR'S NAME Gancarz DATE/TIME SAMPLED 6/21/84 1000

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION Sediment

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE
☐ OTHER		

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY Jane Lindsey DATE RECEIVED 6-22-84

LAB SAMPLE NO. COMMENTS broken

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-24

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION CRUTCHO CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS ORDINANCE DEPOT

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 1130

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6-22-84

LAB SAMPLE NO. 8406206-04 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED-25

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION CRUTCHO CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS HARD SEDIMENT ON BOTTOM.

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 1220

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6-22-84

LAB SAMPLE NO. 8406206-05 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED 26

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION CRUTCHO CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS GOLF COURSE

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 1300

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 6 22 84

LAB SAMPLE NO. 8406206-06 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN
CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED 27

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION KHULMAN CREEK

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS OIL FILM, MUSKRAT

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 1330

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [illegible signature] DATE RECEIVED 6-22-84

LAB SAMPLE NO. 8406206-07 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. TSED 28

COMPANY SAMPLED/ADDRESS TINKER AFB

SAMPLE POINT DESCRIPTION AREA D

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS DRY, HARD SOIL. 10' FROM CULVERT APRON

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 6/21/84 1400

AMOUNT OF SAMPLE COLLECTED 1 l

SAMPLE DESCRIPTION SEDIMENT

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☐ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY Jane Kindrey DATE RECEIVED 6-22-84

LAB SAMPLE NO. — COMMENTS broken

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN
CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. 7F, 6D, 6G

Company Sampled/Address TINKER AFB OKLAHOMA

Sample Point Description MONITOR WELLS 7F, 6D, 6G

Stream Characteristics:

Temperature N/A Flow N/A pH N/A

Visual Observations/Comments

Collector's Name NANCY STEIN Date/Time Sampled 7/16/84, 7/17/84

Amount of Sample Collected

Sample Description WELL WATER

Store at: ☐ Ambient ☒ 5°C ☐ −10°C ☐ Other

☒ Caution - No more sample available ☐ Return unused portion of sample ☐ Discard unused portions

Other Instructions - Special Handling - Hazards NONE

☐ Hazardous sample (see below) ☒ Non-hazardous sample

☐ Toxic ☐ Skin irritant ☐ Flammable (FP< 40°C)
☐ Pyrophoric ☐ Lachrymator ☐ Shock sensitive
☐ Acidic ☐ Biological ☐ Carcinogenic - suspect
☐ Caustic ☐ Peroxide ☐ Radioactive
☐ Other

Sample Allocation/Chain of Possession:

Organization Name RAS
Received By [signature] Date Received 7-18-84 Time 11.00
Transported By Fed Ex Lab Sample No. 8407090
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. 6A, B, C, 7F, 6

Company Sampled/Address TINKER AFB

Sample Point Description WELL WATER

Stream Characteristics:

Temperature N/A Flow N/A pH N/A

Visual Observations/Comments NONE

Collector's Name NANCY STEIN Date/Time Sampled 7/17/84 – 7/18/84

Amount of Sample Collected 2 VOA / SITE

Sample Description EPA 601

Store at: ☐ Ambient ☑ 5°C ☐ –10°C ☐ Other

☑ Caution - No more sample available ☐ Return unused portion of sample ☐ Discard unused portions

Other Instructions - Special Handling - Hazards

☐ Hazardous sample (see below) ☑ Non-hazardous sample

☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
☐ Other		

Sample Allocation/Chain of Possession:

Organization Name RAS

Received By [signature] Date Received 7-20-84 Time 10:00

Transported By Fed Ex Lab Sample No. 8407112

Comments sample 7F not received

Inclusive Dates of Possession

Organization Name

Received By Date Received Time

Transported By Lab Sample No.

Comments

Inclusive Dates of Possession

Organization Name

Received By Date Received Time

Transported By Lab Sample No.

Comments

Inclusive Dates of Possession

RADIAN
CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. TSED-20

Company Sampled/Address TINKER AFB
Sample Point Description CRUTCHO CREEK
Stream Characteristics:
Temperature N/A Flow N/A pH N/A
Visual Observations/Comments NONE

Collector's Name GANCARZ Date/Time Sampled 7/12/84
Amount of Sample Collected 1 l
Sample Description SEDIMENT
Store at: ☐ Ambient ☒ 5°C ☐ −10°C ☐ Other

☐ Caution - No more sample available ☐ Return unused portion of sample ☒ Discard unused portions

Other Instructions - Special Handling - Hazards

☐ Hazardous sample (see below) ☒ Non-hazardous sample

☐ Toxic ☐ Skin irritant ☐ Flammable (FP< 40°C)
☐ Pyrophoric ☐ Lachrymator ☐ Shock sensitive
☐ Acidic ☐ Biological ☐ Carcinogenic - suspect
☐ Caustic ☐ Peroxide ☐ Radioactive
☐ Other

Sample Allocation/Chain of Possession:
Organization Name RAS -
Received By [signature] Date Received 7-20-84 Time 10:00
Transported By Fed Ex Lab Sample No. 8407113-01
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

RADIAN
CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. TSED-23

Company Sampled/Address TINKER AFB
Sample Point Description CRUTCHO CREEK

Stream Characteristics:
Temperature N/A Flow N/A pH N/A
Visual Observations/Comments NONE

Collector's Name D GANCARZ Date/Time Sampled 7/19/84
Amount of Sample Collected 1 l
Sample Description SEDIMENT
Store at: ☐ Ambient ☒ 4°C ☐ −10°C ☐ Other

☐ Caution - No more sample available ☐ Return unused portion of sample ☒ Discard unused portions

Other Instructions - Special Handling - Hazards

☐ Hazardous sample (see below) ☒ Non-hazardous sample

☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive

☐ Other

Sample Allocation/Chain of Possession:
Organization Name RAS
Received By [signature] Date Received 7-20-84 Time 10:00
Transported By Fed Ex Lab Sample No. 8407113-02
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

RADIAN
CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. TSED 28

Company Sampled/Address TINKER AFB
Sample Point Description AREA D

Stream Characteristics:
Temperature N/A Flow N/A pH N/A
Visual Observations/Comments NONE

Collector's Name GANCARZ Date/Time Sampled 7/19/84
Amount of Sample Collected 1 l
Sample Description SEDIMENT
Store at: ☐ Ambient ☑ 5°C ☐ −10°C ☐ Other

☐ Caution - No more sample available ☐ Return unused portion of sample ☑ Discard unused portions
Other Instructions - Special Handling - Hazards

☐ Hazardous sample (see below) ☑ Non-hazardous sample

☐ Toxic ☐ Skin irritant ☐ Flammable (FP< 40°C)
☐ Pyrophoric ☐ Lachrymator ☐ Shock sensitive
☐ Acidic ☐ Biological ☐ Carcinogenic - suspect
☐ Caustic ☐ Peroxide ☐ Radioactive
☐ Other

Sample Allocation/Chain of Possession:
Organization Name RAS
Received By [signature] Date Received 7-20-84 Time 10:00
Transported By Fed Ex Lab Sample No. 8407113-03
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

6C, 6D, 6E, 6F, 6G,
FIELD SAMPLE No. 7A, 7C, 7F, 2A

COMPANY SAMPLED/ADDRESS TINKER AFB, OK

SAMPLE POINT DESCRIPTION MONITOR WELLS

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS NONE

COLLECTOR'S NAME NANCY STEIN/DAG DATE/TIME SAMPLED 7/30/84 — 7/31/84

AMOUNT OF SAMPLE COLLECTED 2 VOA' each site

SAMPLE DESCRIPTION Well water

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☒ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS NONE

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC ☐ SKIN IRRITANT ☐ FLAMMABLE (FP 40°C)

☐ PYROPHORIC ☐ LACHRYMATOR ☐ SHOCK SENSITIVE

☐ ACIDIC ☐ BIOLOGICAL ☐ CARCINOGENIC - SUSPECT

☐ CAUSTIC ☐ PEROXIDE ☐ RADIOACTIVE

☐ OTHER

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS

RECEIVED BY [signature] DATE RECEIVED 8-1-84

LAB SAMPLE No. 8408003 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE No. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN
CORPORATION

CHAIN OF CUSTODY RECORD

6A, 6B, 6D, 6G

Field Sample No. 7G

Company Sampled/Address USAF
Sample Point Description TINKER AFB, OK

Stream Characteristics:
Temperature N/A Flow N/A pH N/A
Visual Observations/Comments NONE

Collector's Name NANCY STEIN Date/Time Sampled 8/1/84
Amount of Sample Collected 2 VOA EACH SITE
Sample Description
Store at: ☐ Ambient ☒ 5°C ☐ −10°C ☐ Other

☒ Caution - No more sample available ☐ Return unused portion of sample ☐ Discard unused portions
Other Instructions - Special Handling - Hazards NONE

☐ Hazardous sample (see below) ☒ Non-hazardous sample

☐ Toxic ☐ Skin irritant ☐ Flammable (FP< 40°C)
☐ Pyrophoric ☐ Lachrymator ☐ Shock sensitive
☐ Acidic ☐ Biological ☐ Carcinogenic - suspect
☐ Caustic ☐ Peroxide ☐ Radioactive
☐ Other

Sample Allocation/Chain of Possession:
Organization Name QAS
Received By [signature] Date Received 8-2-84 Time 11:15
Transported By Fed Ex Lab Sample No. 8408020
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

FIELD SAMPLE NO. 6E, 6F, 7C, 7A, 7C

COMPANY SAMPLED/ADDRESS USAF

SAMPLE POINT DESCRIPTION TINKER AFB, OKLAHOMA

STREAM CHARACTERISTICS:

TEMPERATURE N/A FLOW N/A pH N/A

VISUAL OBSERVATIONS/COMMENTS NONE

COLLECTOR'S NAME GANCARZ DATE/TIME SAMPLED 8/14/84 — 8/15/84

AMOUNT OF SAMPLE COLLECTED 2 VOA VIAL EACH SITE

SAMPLE DESCRIPTION EPA 601

STORE AT: ☐ AMBIENT ☒ 5°C ☐ -10°C ☐ OTHER

☒ CAUTION - NO MORE SAMPLE AVAILABLE ☐ RETURN ALL PORTIONS ☐ RETURN UNUSED PORTION OF SAMPLE

OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS NONE

☐ HAZARDOUS SAMPLE (SEE BELOW) ☒ NON-HAZARDOUS SAMPLE

☐ TOXIC	☐ SKIN IRRITANT	☐ FLAMMABLE (FP 40°C)
☐ PYROPHORIC	☐ LACHRYMATOR	☐ SHOCK SENSITIVE
☐ ACIDIC	☐ BIOLOGICAL	☐ CARCINOGENIC - SUSPECT
☐ CAUSTIC	☐ PEROXIDE	☐ RADIOACTIVE
☐ OTHER		

SAMPLE ALLOCATION / CHAIN OF POSSESSION:

ORGANIZATION NAME RAS -

RECEIVED BY Gail Lindsey DATE RECEIVED 8-16-84

LAB SAMPLE NO. ~~[illegible]~~ 8408167 COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

ORGANIZATION NAME

RECEIVED BY DATE RECEIVED

LAB SAMPLE NO. COMMENTS

INCLUSIVE DATES OF POSSESSION

RADIAN
CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. 7F, 6D, 6G

Company Sampled/Address TINKER AFB OKLAHOMA
Sample Point Description MONITOR WELLS 7F, 6D, 6G

Stream Characteristics:
Temperature N/A Flow N/A pH N/A
Visual Observations/Comments

Collector's Name NANCY STEIN Date/Time Sampled 7/16/84, 7/17/84
Amount of Sample Collected
Sample Description WELL WATER
Store at: ☐ Ambient ☒ 5°C ☐ −10°C ☐ Other

☐ Caution - No more sample available ☐ Return unused portion of sample ☒ Discard unused portions
Other Instructions - Special Handling - Hazards NONE

☐ Hazardous sample (see below) ☒ Non-hazardous sample

☐ Toxic ☐ Skin irritant ☐ Flammable (FP< 40°C)
☐ Pyrophoric ☐ Lachrymator ☐ Shock sensitive
☐ Acidic ☐ Biological ☐ Carcinogenic - suspect
☐ Caustic ☐ Peroxide ☐ Radioactive
☐ Other

Sample Allocation/Chain of Possession:
Organization Name Radian Corp
Received By [illegible] Date Received 7/18/84 Time 0835
Transported By federal express Lab Sample No. 8407093
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

Organization Name
Received By Date Received Time
Transported By Lab Sample No.
Comments
Inclusive Dates of Possession

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. 6A, B, C, 7[illegible], G

Company Sampled/Address TINKER AFB

Sample Point Description Well samples

Stream Characteristics:

Temperature N/A Flow N/A pH N/A

Visual Observations/Comments NONE

Collector's Name NANCY STEIN Date/Time Sampled 7/17/84 — 7/18/84

Amount of Sample Collected 2 VOA & 1 liter per site

Sample Description EPA 624/625

Store at: ☐ Ambient ☒ 5°C ☐ −10°C ☐ Other

☒ Caution - No more sample available ☐ Return unused portion of sample ☐ Discard unused portions

Other Instructions - Special Handling - Hazards NONE

☐ Hazardous sample (see below) ☒ Non-hazardous sample

☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
☐ Other		

Sample Allocation/Chain of Possession:

Organization Name Radian Corporation

Received By BJ Oggar Date Received 7/20/84 Time 8:35

Transported By ~~[illegible]~~ Fed-X Lab Sample No. 8407131

Comments Rec'd only samples: 6A, B, C + 7G

Inclusive Dates of Possession

Organization Name

Received By Date Received Time

Transported By Lab Sample No.

Comments

Inclusive Dates of Possession

Organization Name

Received By Date Received Time

Transported By Lab Sample No.

Comments

Inclusive Dates of Possession

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

Field Sample No. 6D, 6E, 6F, 6G, 7A, 7C

Company Sampled/Address: Tinker AFB

Sample Point Description: Well Samples

Stream Characteristics:

Temperature: N/A Flow: N/A pH: N/A

Visual Observations/Comments: ____

Collector's Name: Nancy P Stein Date/Time Sampled: July 30 - 31

Amount of Sample Collected: 2 VOA and 1 liter / sample

Sample Description: Well Water

Store at: ☐ Ambient ☒ 5°C ☐ −10°C ☐ Other ____

☒ Caution - No more sample available ☐ Return unused portion of sample ☐ Discard unused portions

Other Instructions - Special Handling - Hazards: None

☐ Hazardous sample (see below) ☒ Non-hazardous sample

☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
☐ Other ____		

Sample Allocation/Chain of Possession:

Organization Name: Radian Corporation

Received By: ____ Date Received: 8/1/84 Time: 4:00 PM

Transported By: Federal Express Lab Sample No. 84-08-013

Comments: ____

Inclusive Dates of Possession: ____

Organization Name: ____

Received By: ____ Date Received: ____ Time: ____

Transported By: ~~Federal Express~~ Lab Sample No. ____

Comments: ____

Inclusive Dates of Possession: ____

Organization Name: ____

Received By: ____ Date Received: ____ Time: ____

Transported By: ____ Lab Sample No. ____

Comments: ____

Inclusive Dates of Possession: ____

APPENDIX H

Analytical Data

All samples for chemical analysis were submitted to Radian Analytical Services' laboratory. The samples were logged in, and the data reported out, in "batches". The following pages contain the analytical data reports for the various batches of samples. Table H-1 is a key for assigning the samples to the proper batch. Table H-2 is a cross-reference between zones and corresponding laboratory sample batches.

RADIAN CORPORATION

TABLE H-1. LABORATORY BATCH BREAKOUT KEY

Lab # 84-06-166, June 20, 1984
Sediment Samples TSED-01, 02, 03, 04, 05, 06

Lab # 84-06-190, June 21, 1984
Sediment Samples TSED-07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 18

Lab # 84-06-206, June 22, 1984
Sediment Samples TSED-19, 21, 22, 24, 25, 26, 27

Lab # 84-07-090, July 18, 1984
6D, 6G, 7F for EPA Method 601

Lab # 84-07-093, July 18, 1984
6D, 6G, 7F for EPA Method 624/625

Lab # 84-07-112, July 20, 1984
6A, 6B, 6C, 7G for EPA Method 601

Lab # 84-07-113, July 20, 1984
Sediment Samples TSED-20, 23, 28

Lab # 84-07-131, July 23, 1984
6A, 6B, 6C, 7G for EPA Method 624/625

Lab # 84-08-003, August 1, 1984
2A, 6C, 6D, 6E, 6F, 6G, 7A, 7C, 7F for EPA Method 601

Lab # 84-08-013, August 1, 1984
6D, 6E, 6F, 6G, 7A, 7C, for EPA Method 624/625

Lab # 84-08-020, August 2, 1984
6A, 6B, 6D, 6G, 7G for EPA Method 601

Lab # 84-08-167, August 16, 1984
6E, 6F, 7A, 7C (Sample on 8/14), 7C (Sample on 8/15) for EPA Method 601

RADIAN CORPORATION

TABLE H-2. CROSS REFERENCE

	Sampling Station (Figure 3-4)	Lab # 84-
Sediments - TSED-01	1	06-166
02	2	06-166
03	3	06-166
04	4	06-166
05	4 (duplicate)	06-166
06	20	06-166
07	12	06-190
08	13	06-190
09	22	06-190
10	21	06-190
11	17	06-190
12	18	06-190
13	15	06-190
14	16	06-190
15	14	06-190
16	19	06-190
17	discarded*	06-190
18	15 (duplicate)	06-190
19	10	06-206
20	8	07-113
21	9	06-206
22	9 (duplicate)	06-206
23	7	07-113
24	6	06-206
25	5	06-206
26	11	06-206
27	23	06-206
28	24	07-113
Monitor Wells - 2A		08-003
6A		07-112, 07-131, 08-020
6B		07-112, 07-131, 08-020
6C		07-112, 07-131, 08-003
6D		07-090, 07-093, 08-003, 08-013, 08-020
6E		08-003, 08-013, 08-167
6F		08-003, 08-013, 08-167
6G		07-090, 07-093, 08-003, 08-013, 08-020
7A		08-003, 08-013, 08-167
7C		08-003, 08-013, 08-167
7F		07-090, 07-093, 08-003
7G		07-112, 07-131, 08-020

*Incorrect sample site; sample discarded.

Analytical Serv REPORT LAB # 84-06-166

RECEIVED: 06/20/84 04/26/85 12:15:10

REPORT TO Radian
Bl. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 6
COMPANY Tinker AFB
FACILITY

WORK ID sediments
TAKEN Goncarz
TRANS Fed Ex
TYPE
P.O. # 212-027-21-05
INV. # 3795

PREPARED BY Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766
ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

RCRA Herbicides and RCRA Pesticides results are reported in ug/g.

Duplicate of report of 08/15/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

01	TSED-01
02	TSED-02
03	TSED-03
04	TSED-04
05	TSED-05
06	TSED-06

Analytical Serv TEST CODES and NAMES used on this report

AG E	Silver, ICPES
AS GA	Arsenic, low level
BA E	Barium, ICPES
CD E	Cadmium, ICPES
CNTOTA	Total Cyanide
CR E	Chromium, ICPES
CU E	Copper, ICPES
F IC	Fluoride, IC
H1RCRA	RCRA Herbicides
HG CA	Mercury, Cold Vapor
MN E	Manganese, ICPES
NI E	Nickel, ICPES
NO3 IC	Nitrate, IC
P1RCRA	RCRA Pesticides
PB GA	Lead, low level
PCB SS	PCBs in Soil
PHEN A	Total Phenolics
PH A	pH
PREP W	Special Digestion Method
PREP X	Special Digestion Method
SE GA	Selenium, low level
TOC	Total Organic Carbon
ZN E	Zinc, ICPES

RECEIVED: 06/20/84

Analytical Serv REPORT LAB # 84-06-166

RESULTS BY TEST

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
AG_E	<1.8	<1.7	<2	<2	<2
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
AS_GA	0.35	0.41	0.31	0.36	0.52
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
BA_E	480	240	290	410	450
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
CD_E	<.050	<.41	4.7	2.2	<.063
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
CNTOTA	<.01	<.01	<.01	<.01	<.01
mg/L	ug/g	ug/g	ug/g	ug/g	ug/g
CR_E	11	55	320	43	48
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
CU_E	2.8	5.7	24	3.6	5.9
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
F_IC	0.5	0.33	0.33	0.23	0.30
mg/L	ug/g	ug/g	ug/g	ug/g	ug/g
HG_CA	0.049	0.061	0.051	0.060	0.038
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
MN_E	900	920	270	410	630
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
NI_E	9.7	7.8	9.5	15	13
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
NO3_IC	1.4	<.6	<.6	<.6	<.6
mg/L	ug/g	ug/g	ug/g	ug/g	ug/g
PB_GA	10	0.36	23	14	21
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
PCB_SS	ND	ND	ND	ND	ND
ug/g					

PHEN_A mg/L	<.01 ug/g	0.18 ug/g	0.11 ug/g	0.05 ug/g	0.02 ug/g
PH_A pH units	7.10	6.90	7.10	6.75	6.71
PREP_W date complete	06/22/84	06/22/84	06/22/84	06/22/84	06/22/84
PREP_X date complete	09/27/84	06/27/84	06/27/84	06/27/84	06/27/84
SE_GA ug/ml	0.55 ug/g	0.61 ug/g	0.39 ug/g	0.48 ug/g	0.53 ug/g
TOC mg/L	0.52 ug/g	0.38 ug/g	0.63 ug/g	1.03 ug/g	0.42 ug/g
ZN_E ug/ml	18 ug/g	24 ug/g	54 ug/g	24 ug/g	24 ug/g

TEST CODE default units	Sample 06 (entered units)
AG_E ug/ml	<2 ug/g
AS_GA ug/ml	0.49 ug/g
BA_E ug/ml	520 ug/g
CD_E ug/ml	2.4 ug/g
CNTOTA mg/L	<.01 ug/g
CR_E ug/ml	5100 ug/g

CU_E ug/ml	23 ug/g
F_IC mg/L	0.62 ug/g
HG_CA ug/ml	0.049 ug/g
MN_E ug/ml	710 ug/g
NI_E ug/ml	47 ug/g
NO3_IC mg/L	2.14 ug/g
PB_GA ug/ml	100 ug/g
PCB_SS ug/g	ND
PHEN_A mg/L	0.09 ug/g
PH_A pH units	8.53
PREP_W date complete	06/22/84
PREP_X date complete	06/27/84
SE_GA ug/ml	0.61 ug/g
TOC mg/L	2.28 ug/g
ZN_E ug/ml	68 ug/g

Analytical Serv REPORT LAB # 84-06-166

RECEIVED: 06/20/84 Results by Sample

SAMPLE ID TSED-01 FRACTION 01B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 07/17/84 DATE INJECTED 07/23/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-01 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 06/29/84 DATE INJECTED 07/06/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.

CORPORATION

RECEIVED: 06/20/84 Analytical Serv REPORT Results by Sample LAB # 84-06-166 Continued From Above

SAMPLE ID TSED-01 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-02 FRACTION 02B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 07/17/84 DATE INJECTED 07/23/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-02 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 06/29/84 DATE INJECTED 07/06/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				

SAMPLE ID TSED-02 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

Toxaphene	<.02	

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-03 FRACTION 03B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 07/17/84 DATE INJECTED 07/23/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-03 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 06/29/84 DATE INJECTED 07/06/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

SAMPLE ID TSED-03 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-04 FRACTION 04B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 07/17/84 DATE INJECTED 07/23/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

Analytical Serv REPORT LAB # 84-06-166

RECEIVED: 06/20/84 Results by Sample

SAMPLE ID TSED-04 FRACTION 04B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 06/29/84 DATE INJECTED 07/06/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-05 FRACTION 05B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 07/17/84 DATE INJECTED 07/23/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.

RECEIVED: 06/20/84

Analytical Serv REPORT
Results by Sample

LAB # 84-06-166
Continued From Above

SAMPLE ID TSED-05 FRACTION 05B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-05 FRACTION 05B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 06/29/84 DATE INJECTED 07/06/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-06 FRACTION 06B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 07/17/84 DATE INJECTED 07/23/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT

RECEIVED: 06/20/84

Analytical Serv REPORT
Results by Sample

LAB # 84-06-166
Continued From Above

SAMPLE ID TSED-05 FRACTION 05B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-05 FRACTION 05B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 06/29/84
CONCENTRATION FACTOR

DATE INJECTED 07/06/84
ANALYST DRL

VERIFIED BY LLN

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-06 FRACTION 06B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 07/17/84
CONCENTRATION FACTOR

DATE INJECTED 07/23/84
ANALYST DRL

VERIFIED BY LLN

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT

RECEIVED: 06/20/84

Analytical Serv REPORT
Results by Sample

LAB # 84-06-166
Continued From Above

SAMPLE ID TSED-06 FRACTION 06B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected 06/19/84 Category

2,4-D	<.2	
2,4,5-TP (Silvex)	<.2	

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-06 FRACTION 06B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected 06/19/84 Category

DATE EXTRACTED 06/29/84 DATE INJECTED 07/06/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

RADIAN CORPORATION

PAGE 1
RECEIVED: 06/21/84

Analytical Serv REPORT
04/26/85 11:49:10

LAB # 84-06-190

REPORT TO: Radian
Bl. 4
Austin

ATTEN: William Little

CLIENT: TINKER — SAMPLES: 12
COMPANY: Tinker AFB
FACILITY:

WORK ID: sediments
TAKEN: Gancarz
TRANS: Fed Ex
TYPE:
P.O. #: 212-027-21-05
INV. #: 3844

PREPARED BY: Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN:
PHONE: (512) 454-4797

CERTIFIED BY

CONTACT: CONOVER

P1RCRA and R1RCRA are reported in ug/g.

Duplicate of report of 08/16/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

H-17

SAMPLE IDENTIFICATION

01	TSED-07
02	TSED-08
03	TSED-09
04	TSED-10
05	TSED-11
06	TSED-12
07	TSED-13
08	TSED-14
09	TSED-15
10	TSED-16
11	TSED-18
12	TSED-17

Analytical Serv TEST CODES and NAMES used on this report

AG E	Silver, ICPES
AS GA	Arsenic, low level
BA E	Barium, ICPES
CD E	Cadmium, ICPES
CNTOTA	Total Cyanide
CR E	Chromium, ICPES
CU E	Copper, ICPES
F IC	Fluoride, IC
H1RCRA	RCRA Herbicides
HG CA	Mercury, Cold Vapor
MN E	Manganese, ICPES
NI E	Nickel, ICPES
NO3 IC	Nitrate, IC
P1RCRA	RCRA Pesticides
PB GA	Lead, low level
PCB SS	PCBs in Soil
PHEN A	Total Phenolics
PH A	pH
PREP W	Special Digestion Method
PREP X	Special Digestion Method
SE GA	Selenium, low level
TOC	Total Organic Carbon
ZN E	Zinc, ICPES

RECEIVED: 06/21/84

Analytical Serv REPORT LAB # 84-06-190

RESULTS BY TEST

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
AG_E ug/ml	<2 ug/g	<2 ug/g	<2 ug/g	<2 ug/g	<2 ug/g
AS_GA ug/ml	1.9 ug/g	2.1 ug/g	3.5 ug/g	0.91 ug/g	0.66 ug/g
BA_E ug/ml	430 ug/g	480 ug/g	380 ug/g	230 ug/g	170 ug/g
CD_E ug/ml	1.1 ug/g	0.36 ug/g	1.6 ug/g	0.54 ug/g	50 ug/g
CNTOTA mg/L	<.01 ug/g	<.01 ug/g	<.01 ug/g	<.01 ug/g	<.01 ug/g
CR_E ug/ml	37 ug/g	12 ug/g	33 ug/g	80 ug/g	1300 ug/g
CU_E ug/ml	5.1 ug/g	4.4 ug/g	10 ug/g	25 ug/g	45 ug/g
F_IC mg/L	0.22 ug/g	0.20 ug/g	0.51 ug/g	0.31 ug/g	0.31 ug/g
HG_CA ug/ml	0.038 ug/g	0.048 ug/g	0.19 ug/g	0.33 ug/g	0.35 ug/g
MN_E ug/ml	1000 ug/g	940 ug/g	4700 ug/g	180 ug/g	790 ug/g
NI_E ug/ml	9.5 ug/g	9.4 ug/g	11 ug/g	12 ug/g	230 ug/g
NO3_IC mg/L	<.6 ug/g	<.6 ug/g	<.6 ug/g	<.6 ug/g	<.6 ug/g
PB_GA ug/ml	27 ug/g	15 ug/g	44 ug/g	39 ug/g	46 ug/g
PCB_SS ug/g	<10.	<10.	<10.	<10.	<10.

PHEN_A mg/L	0.13 ug/g	0.10 ug/g	0.08 ug/g	0.11 ug/g	0.04 ug/g
PH_A pH_units	7.19	7.32	7.24	7.03	7.73
PREP_W date_complete	06/25/84	06/25/84	06/25/84	06/25/84	06/25/84
PREP_X date_complete	06/27/84	06/27/84	06/27/84	06/27/84	06/27/84
SE_GA ug/ml	0.93 ug/g	1.0 ug/g	1.8 ug/g	0.32 ug/g	0.28 ug/g
TOC mg/L	0.41 ug/g	0.59 ug/g	0.54 ug/g	0.41 ug/g	0.87 ug/g
ZN_E ug/ml	32 ug/g	17 ug/g	35 ug/g	66 ug/g	83 ug/g

TEST CODE default units	Sample 06 (entered units)	Sample 07 (entered units)	Sample 08 (entered units)	Sample 09 (entered units)	Sample 10 (entered units)
AG_E ug/ml	<2 ug/g	<2 ug/g	<2 ug/g	<2.8 ug/g	<2 ug/g
AS_GA ug/ml	0.31 ug/g	1.6 ug/g	0.54 ug/g	0.28 ug/g	0.62 ug/g
BA_E ug/ml	410 ug/g	220 ug/g	320 ug/g	330 ug/g	220 ug/g
CD_E ug/ml	12 ug/g	1.3 ug/g	0.70 ug/g	30 ug/g	11 ug/g
CNTOTA mg/L	<.01 ug/g	<.01 ug/g	<.01 ug/g	<.01 ug/g	<.01 ug/g
CR_E ug/ml	130 ug/g	190 ug/g	27 ug/g	140 ug/g	300 ug/g

RECEIVED: 06/21/84

Analytical Serv REPORT
RESULTS BY TEST

LAB # 84-06-190
CONTINUED FROM ABOVE

CU_E	160	230	3.8	52	69
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
F_IC	0.23	0.20	0.37	0.16	0.33
mg/L	ug/g	ug/g	ug/g	ug/g	ug/g
HG_CA	0.10	1.0	0.034	1.6	0.14
ug/ml	ug/g	ug/g	ug/g	ug/g	
MN_E	330	250	530	140	170
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
NI_E	83	43	6.4	19	170
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
NO3_IC	<.6	<.6	<.6	<.6	<.6
mg/L	ug/g	ug/g	ug/g	ug/g	ug/g
PB_GA	700	140	7.1	530	52
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
PCB_SS	<10.	<10.	<10.	<10.	2.20
ug/g					
PHEN_A	0.09	0.10	0.11	0.06	0.14
mg/L	ug/g	ug/g	ug/g	ug/g	ug/g
PH_A	7.54	7.19	7.25	7.01	7.16
pH units					
PREP_W	06/25/84	06/25/84	06/25/84	06/25/84	06/25/84
date complete					
PREP_X	06/27/84	06/27/84	06/27/84	06/27/84	06/27/84
date complete					
SE_GA	0.12	0.93	0.21	0.21	0.32
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g
TOC	0.43	1.32	0.25	3.80	1.68
mg/L	ug/g	ug/g	ug/g	ug/g	ug/g
ZN_E	88	210	16	160	60
ug/ml	ug/g	ug/g	ug/g	ug/g	ug/g

TEST CODE default units	Sample 11 (entered units)
AG_E ug/ml	<2 ug/g
AS_GA ug/ml	0.51 ug/g
BA_E ug/ml	200 ug/g
CD_E ug/ml	4.9 ug/g
CNTOTA mg/L	<.01 ug/g
CR_E ug/ml	120 ug/g
CU_E ug/ml	54 ug/g
F_IC mg/L	0.31 ug/g
HG_CA ug/ml	0.33 ug/g
MN_E ug/ml	250 ug/g
NI_E ug/ml	12 ug/g
NO3_IC mg/L	<.6 ug/g
PB_GA ug/ml	97 ug/g
PCB_SS ug/g	<10.

PHEN_A mg/L	0.10 ug/g
PH_A pH_units	7.15
PREP_W date_complete	06/25/84
PREP_X date_complete	06/27/84
SE_GA ug/ml	0.31 ug/g
TOC mg/L	0.65 ug/g
ZN_E ug/ml	77 ug/g

CORPORATION

Analytical Serv REPORT LAB # 84-06-190

RECEIVED: 06/21/84

Results by Sample

SAMPLE ID TSED-07 FRACTION 01B TEST CODE H1RCRA NAME RCRA Herbicides

Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF

CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.

ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-07 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides

Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF

CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.

RECEIVED: 06/21/84 Results by Sample Continued From Above

SAMPLE ID TSED-07 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category ______

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-08 FRACTION 02B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category ______

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-08 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category ______

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				

SAMPLE ID TSED-08 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

Toxaphene	<.02	

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-09 FRACTION 03B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-09 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

SAMPLE ID TSED-09 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-10 FRACTION 04B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

RECEIVED: 06/21/84

Analytical Serv REPORT

Results by Sample

LAB # 84-06-190

SAMPLE ID TSED-10 FRACTION 04B TEST CODE P1RCRA NAME RCRA Pesticides

Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84
CONCENTRATION FACTOR

DATE INJECTED 06/29/84
ANALYST DRL

VERIFIED BY MSF

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.

ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-11 FRACTION 05B TEST CODE H1RCRA NAME RCRA Herbicides

Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84
CONCENTRATION FACTOR

DATE INJECTED 07/16/84
ANALYST DRL

VERIFIED BY MSF

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.

SAMPLE ID TSED-11 FRACTION 05B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-11 FRACTION 05B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-12 FRACTION 06B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT

CORPORATION

RECEIVED: 06/21/84

Analytical Serv REPORT
Results by Sample

LAB # 84-06-190
Continued From Above

SAMPLE ID TSED-12 FRACTION 06B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

2,4-D	<.2	
2,4,5-TP (Silvex)	<.2	

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-12 FRACTION 06B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

CORPORATION

Analytical Serv REPORT LAB # 84-06-190
RECEIVED: 06/21/84
Results by Sample

SAMPLE ID TSED-13 FRACTION 07B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-13 FRACTION 07B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.

SAMPLE ID TSED-13 FRACTION 07B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-14 FRACTION 08B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-14 FRACTION 08B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				

SAMPLE ID TSED-14 FRACTION 08B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

Toxaphene	<.02	

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-15 FRACTION 09B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-15 FRACTION 09B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

RECEIVED: 06/21/84

Analytical Serv REPORT
Results by Sample

LAB # 84-06-190
Continued From Above

SAMPLE ID TSED-15

FRACTION 09B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-16

FRACTION 10B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84 DATE INJECTED 07/16/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

RECEIVED: 06/21/84

Analytical Serv REPORT
Results by Sample

LAB # 84-06-190

SAMPLE ID TSED-16

FRACTION 10B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84
CONCENTRATION FACTOR

DATE INJECTED 06/29/84
ANALYST DRL

VERIFIED BY MSF

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-18

FRACTION 11B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/09/84
CONCENTRATION FACTOR

DATE INJECTED 07/16/84
ANALYST DRL

VERIFIED BY MSF

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<.2				
2,4,5-TP (Silvex)	<.2				

NOTES AND DEFINITIONS FOR THIS REPORT.

SAMPLE ID TSED-18 FRACTION 11B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-18 FRACTION 11B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 06/25/84 DATE INJECTED 06/29/84 VERIFIED BY MSF
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

12A : LOG_IN

CORPORATION

PAGE 1 Analytical Serv REPORT LAB # 84-06-206
RECEIVED: 06/22/84 04/26/85 11:52:34

REPORT TO Radian
Bl. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 7
COMPANY Tinker AFB
FACILITY

WORK ID sediments
TAKEN Gancarz
TRANS Fed Ex
TYPE
P.O. # 212-027-21-05
INV. # 3829

PREPARED BY Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

RCRA Herbicides and RCRA Pesticides are reported in ug/g.

Duplicate of report of 08/15/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

01	TSED-19
02	TSED-21
03	TSED-22
04	TSED-24
05	TSED-25
06	TSED-26
07	TSED-27

Analytical Serv TEST CODES and NAMES used on this report

AG E	Silver, ICPES
AS GA	Arsenic, low level
BA E	Barium, ICPES
CD E	Cadmium, ICPES
CNTOTA	Total Cyanide
CR E	Chromium, ICPES
CU E	Copper, ICPES
F IC	Fluoride, IC
H1RCRA	RCRA Herbicides
HG CA	Mercury, Cold Vapor
MN E	Manganese, ICPES
NI E	Nickel, ICPES
NO3 IC	Nitrate, IC
P1RCRA	RCRA Pesticides
PB GA	Lead, low level
PCB SS	PCBs in Soil
PHEN A	Total Phenolics
PH A	pH
PREP W	Special Digestion Method
PREP X	Special Digestion Method
SE GA	Selenium, low level
TOC	Total Organic Carbon
ZN E	Zinc, ICPES

CORPORATION

RECEIVED: 06/22/84

Analytical Serv REPORT LAB # 84-06-206

RESULTS BY TEST

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)	Sample 04 (entered units)	Sample 05 (entered units)
AG_E ug/ml	<2 ug/g	<2 ug/g	<2 ug/g	<2 ug/g	<2 ug/g
AS_GA ug/ml	0.81 ug/g	1.5 ug/g	2.7 ug/g	2.3 ug/g	0.64 ug/g
BA_E ug/ml	330 ug/g	390 ug/g	370 ug/g	480 ug/g	310 ug/g
CD_E ug/ml	3.9 ug/g	3.0 ug/g	1.5 ug/g	2.7 ug/g	2.4 ug/g
CNTOTA mg/L	<.02 ug/g	<.02 ug/g	<.02 ug/g	<.02 ug/g	<.02 ug/g
CR_E ug/ml	68 ug/g	80 ug/g	71 ug/g	150 ug/g	51 ug/g
CU_E ug/ml	12 ug/g	12 ug/g	11 ug/g	13 ug/g	8.3 ug/g
F_IC mg/L	0.2 ug/g	0.23 ug/g	0.31 ug/g	0.38 ug/g	0.54 ug/g
HG_CA ug/ml	0.45 ug/g	0.06 ug/g	0.12 ug/g	0.090 ug/g	0.094 ug/g
MN_E ug/ml	250 ug/g	790 ug/g	1000 ug/g	720 ug/g	310 ug/g
NI_E ug/ml	7.4 ug/g	10 ug/g	8.3 ug/g	14 ug/g	12 ug/g
NO3_IC mg/L	2.8 ug/g	<.1 ug/g	0.46 ug/g	<.1 ug/g	1.4 ug/g
PB_GA ug/ml	40 ug/g	49 ug/g	23 ug/g	45 ug/g	11 ug/g
PCB_SS ug/g	ND	ND	ND	ND	ND

PHEN_A mg/L	<.01 ug/g	<.01 ug/g	<.01 ug/g	<.01 ug/g	<.01 ug/g
PH_A pH units	7.62	7.26	6.34	7.34	6.39
PREP_W date complete	06/27/84	06/27/84	06/27/84	06/27/84	06/27/84
PREP_X date complete	06/27/84	06/27/84	06/27/84	06/27/84	06/27/84
SE_GA ug/ml	0.67 ug/g	0.65 ug/g	0.48 ug/g	0.63 ug/g	0.71 ug/g
TOC mg/L	0.81 ug/g	1.48 ug/g	1.01 ug/g	0.44 ug/g	1.32 ug/g
ZN_E ug/ml	43 ug/g	33 ug/g	31 ug/g	42 ug/g	22 ug/g

TEST CODE default units	Sample 06 (entered units)	Sample 07 (entered units)
AG_E ug/ml	<2 ug/g	<2 ug/g
AS_GA ug/ml	1.6 ug/g	1.0 ug/g
BA_E ug/ml	320 ug/g	240 ug/g
CD_E ug/ml	1.8 ug/g	2.1 ug/g
CNTOTA mg/L	<.02 ug/g	<.02 ug/g
CR_E ug/ml	13 ug/g	35 ug/g

CU_E ug/ml	4.3 ug/g	0.12 ug/g
F_IC mg/L	<.1 ug/g	<.1 ug/g
HG_CA ug/ml	0.036 ug/g	0.30 ug/g
MN_E ug/ml	500 ug/g	290 ug/g
NI_E ug/ml	3.7 ug/g	5.9 ug/g
NO3_IC mg/L	<.1 ug/g	1.9 ug/g
PB_GA ug/ml	17 ug/g	64 ug/g
PCB_SS ug/g	ND	ND
PHEN_A mg/L	<.01 ug/g	<.01 ug/g
PH_A pH units	7.68	7.16
PREP_W date complete	06/27/84	06/27/84
PREP_X date complete	06/27/84	06/27/84
SE_GA ug/ml	0.63 ug/g	0.43 ug/g
TOC mg/L	0.25 ug/g	0.85 ug/g
ZN_E ug/ml	11 ug/g	49 ug/g

CORPORATION

RECEIVED: 06/22/84

Analytical Serv REPORT
Results by Sample

LAB # 84-06-206

SAMPLE ID TSED-19 FRACTION 01B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/13/84 DATE INJECTED 07/26/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<0.2				
2,4,5-TP (Silvex)	<0.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-19 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 07/01/84 DATE INJECTED 07/02/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.

SAMPLE ID TSED-19 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-21 FRACTION 02B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/13/84 DATE INJECTED 07/26/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<0.2				
2,4,5-TP (Silvex)	<0.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-21 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 07/01/84 DATE INJECTED 07/02/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				

SAMPLE ID TSED-21 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

Toxaphene	<.02	

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-22 FRACTION 03B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/13/84 DATE INJECTED 07/26/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<0.2				
2,4,5-TP (Silvex)	<0.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-22 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 07/01/84 DATE INJECTED 07/02/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

SAMPLE ID TSED-22 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-24 FRACTION 04B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/13/84 DATE INJECTED 07/26/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<0.2				
2,4,5-TP (Silvex)	<0.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

RECEIVED: 06/22/84 Results by Sample

SAMPLE ID TSED-24 FRACTION 04B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 07/01/84 DATE INJECTED 07/02/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-25 FRACTION 05B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/13/84 DATE INJECTED 07/26/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<0.2				
2,4,5-TP (Silvex)	<0.2				

NOTES AND DEFINITIONS FOR THIS REPORT.

SAMPLE ID TSED-25 FRACTION 05B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-25 FRACTION 05B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 07/01/84 DATE INJECTED 07/03/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-26 FRACTION 06B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/13/84 DATE INJECTED 07/26/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT

SAMPLE ID TSED-26 FRACTION 06B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category ______

2,4-D	<0.2	______
2,4,5-TP (Silvex)	<0.2	______

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-26 FRACTION 06B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category ______

DATE EXTRACTED 07/01/84 DATE INJECTED 07/03/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002	______			
Endrin	<.002	______			
Methoxychlor	<.02	______			
Toxaphene	<.02	______			

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

Analytical Serv REPORT LAB # 84-06-206

RECEIVED: 06/22/84 Results by Sample

SAMPLE ID TSED-27 FRACTION 07B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 07/13/84 DATE INJECTED 07/26/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	<0.2				
2,4,5-TP (Silvex)	<0.2				

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-27 FRACTION 07B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 07/01/84 DATE INJECTED 07/03/84 VERIFIED BY LLN
CONCENTRATION FACTOR ANALYST DRL

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	<.002				
Endrin	<.002				
Methoxychlor	<.02				
Toxaphene	<.02				

NOTES AND DEFINITIONS FOR THIS REPORT.

Analytical Serv REPORT

LAB # 84-06-206

RECEIVED: 06/22/84

Results by Sample

Continued From Above

SAMPLE ID TSED-27 FRACTION 07B TEST CODE P1RCRA NAME RCRA Pesticides

Date & Time Collected not specified Category

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

CORPORATION

PAGE 1 Analytical Serv REPORT LAB # 84-07-090

RECEIVED: 07/18/84 04/26/85 11:54:42

REPORT TO Radian
BI. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 3
COMPANY Tinker AFB
FACILITY

WORK ID wells, 601
TAKEN NS
TRANS Fed Ex
TYPE
P.O. # 212-027-21-05
INV. # 3850

PREPARED BY Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

Note: second column confirmation performed on all three samples on this work order.

Duplicate of report of 08/07/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

H-51

SAMPLE IDENTIFICATION

01 6D
02 6G
03 7F

Analytical Serv TEST CODES and NAMES used on this report

GC 601 EPA Method 601/GC

CORPORATION

PAGE 2 | Analytical Serv REPORT | LAB # 84-07-090

RECEIVED: 07/18/84 | Results by Sample

SAMPLE ID 6D | FRACTION 01A | TEST CODE GC 601 | NAME EPA Method 601/GC

Date & Time Collected not specified | Category

DATA FILE B | DATE INJECTED 07/24/84 | ANALYST RGS | VERIFIED BY JSG

CONC. FACTOR | INSTRUMENT b | COMPOUNDS DETECTED 7

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	5	Trichloroethene	0.6
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
1	Methylene Chloride	2.0		2-Chloroethylvinyl Ether	ND
2	Trichlorofluoromethane	1.8		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
3	1,1-Dichloroethane	1.7		Tetrachloroethylene #	ND
4	trans-1,2-Dichloroethene	0.4	6	Chlorobenzene	20.5
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND	7	1,2-Dichlorobenzene	8.4
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

Analytical Serv REPORT
LAB # 84-07-090
RECEIVED: 07/18/84
Results by Sample
Continued From Above

SAMPLE ID 6D FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

PAGE 4 Analytical Serv REPORT LAB # 84-07-090

RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 6G FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 07/25/84 ANALYST RGS VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 6

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	6	Trichloroethene	1.3
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
1	Chloroethane	1.1		cis-1,3-Dichloropropene *	ND
2	Methylene Chloride	1.9		2-Chloroethylvinyl Ether	ND
3	Trichlorofluoromethane	7.6		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
4	Chloroform	4.6		1,3-Dichlorobenzene	ND
5	1,2-Dichloroethane	4.9		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

CORPORATION

RECEIVED: 07/18/84 — Analytical Serv REPORT — Results by Sample — LAB # 84-07-090 — Continued From Above

SAMPLE ID 6G — FRACTION 02A — TEST CODE GC 601 — NAME EPA Method 601/GC
Date & Time Collected not specified — Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

RECEIVED: 07/18/84

Analytical Serv REPORT LAB # 84-07-090

Results by Sample

SAMPLE ID 7F FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE 8 DATE INJECTED 07/25/84 ANALYST RGS VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 10

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
1	Chloromethane	63.8	8	Trichloroethene	0.9
	Bromomethane	ND		Dibromochloromethane *	ND
2	Vinyl Chloride	10.8		1,1,2-Trichloroethane *	ND
3	Chloroethane	15.3		cis-1,3-Dichloropropene *	ND
4	Methylene Chloride	6.0		2-Chloroethylvinyl Ether	ND
5	Trichlorofluoromethane	4.4		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
6	1,1-Dichloroethane	2.3		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND	9	Chlorobenzene	5.7
7	Chloroform	15.9		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND	10	1,4-Dichlorobenzene	6.0
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 7F FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01B : DUP601
02B : DUP601
03B : DUP601

CORPORATION

Analytical Serv REPORT LAB # 84-07-093

RECEIVED: 07/18/84 04/26/85 11:55:37

REPORT TO: Radian
Bl. 4
Austin

ATTEN: William Little

CLIENT: TINKER SAMPLES: 3
COMPANY: Tinker AFB
FACILITY:

WORK ID: Monitor Wells 7F, 6D, 6G
TAKEN: 7/16/84 - 7/17/84, NPS/HG
TRANS: federal express
TYPE: H2O
P.O. #: 212-027-21-05
INV. #: 3851

PREPARED BY: Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN:
PHONE: (512) 454-4797

CERTIFIED BY

CONTACT: CONOVER

Duplicate of report of 08/09/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

01 7F, Area D
02 6D
03 6G, Bldg 3001

Analytical Serv TEST CODES and NAMES used on this report

M625 A Method 625 Acid Compounds
M625 B Method 625 Base/Neutrals
MS 624 EPA Method 624/GC-MS

Analytical Serv REPORT LAB # 84-07-093

RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 7F, Area D FRACTION 01A TEST CODE M625 A NAME Method 625 Acid Compounds
Date & Time Collected 07/17/84 Category ______

DATA FILE 2CU07093C01 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 4 DATE INJECTED 07/31/84 INSTRUMENT ______ COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
11A		21A	2,4,6-trichlorophenol	ND	7A		58A	4-nitrophenol	ND
8A		22A	4-chloro-3-methylphenol	ND	5A		59A	2,4-dinitrophenol	ND
1A		24A	2-chlorophenol	ND	4A		60A	2-methyl-4,6-dinitrophenol	ND
2A		31A	2,4-dichlorophenol	ND	9A		64A	pentachlorophenol	ND
3A		34A	2,4-dimethylphenol	ND	10A		65A	phenol	ND
6A		57A	2-nitrophenol	ND					

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

Analytical Serv REPORT LAB # 84-07-093

RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 7F, Area D FRACTION 01A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/17/84 Category

DATA FILE 2CU07093C01 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 4 DATE INJECTED 07/31/84 INSTRUMENT COMPOUNDS DETECTED 3

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B	1640	66B	bis(2-ethylhexyl)phthalate	8
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B		69B	di-n-octyl phthalate	ND
20B		25B	1,2-dichlorobenzene	ND	24B	1023	70B	diethyl phthalate	32
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B	493	27B	1,4-dichlorobenzene	12	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

CORPORATION

Analytical Serv REPORT

LAB # 84-07-093

RECEIVED: 07/18/84

Results by Sample

Continued From Above

SAMPLE ID 7F, Area D FRACTION 01A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/17/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/l unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

Analytical Serv REPORT LAB # 84-07-093

RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 7F, Area D FRACTION 01B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/17/84 Category

DATA FILE 2CU07093V01 DATE INJECTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 3

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V	339	4V	benzene	8	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V	520	38V	ethylbenzene	18
7V		7V	chlorobenzene	ND	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V		86V	toluene	ND
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V	220	30V	1,2-trans-dichloroethylene	21	31V		88V	vinyl chloride	ND

Analytical Serv REPORT
Results by Sample

RECEIVED: 07/18/84

LAB # 84-07-093
Continued From Above

SAMPLE ID 7F, Area D

FRACTION 01B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/17/84 Category ____________

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

CORPORATION

PAGE 7 Analytical Serv REPORT LAB # 84-07-093

RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 6D FRACTION 02A TEST CODE M625 A NAME Method 625 Acid Compounds

Date & Time Collected 07/17/84 Category

DATA FILE 2CU07093C02 DATE EXTRACTED 07/19/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 07/24/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/l unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

PAGE 8 Analytical Serv REPORT LAB # 84-07-093
RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 6D FRACTION 02A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/17/84 Category

DATA FILE 2CU07093C02 DATE EXTRACTED 07/19/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 2 DATE INJECTED 07/24/84 INSTRUMENT COMPOUNDS DETECTED 1

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B	1635	66B	bis(2-ethylhexyl)phthalate	13
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B		69B	di-n-octyl phthalate	ND
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

CORPORATION

Analytical Serv REPORT

LAB # 84-07-093

RECEIVED: 07/18/84

Results by Sample

Continued From Above

SAMPLE ID 6D FRACTION 02A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/17/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/l unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

RECEIVED: 07/18/84

Analytical Serv REPORT

Results by Sample

LAB # 84-07-093

SAMPLE ID 6D

FRACTION 02B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/17/84 Category

DATA FILE 4CU07093V02 DATE INJECTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED. 1

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V		4V	benzene	ND	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V	481	7V	chlorobenzene	21	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V		86V	toluene	ND
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V		30V	1,2-trans-dichloroethylene	ND	31V		88V	vinyl chloride	ND

SAMPLE ID 6D FRACTION 02B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/17/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

CORPORATION

RECEIVED: 07/18/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-093

SAMPLE ID 6G, Bldg 3001

FRACTION 03A TEST CODE M625 A NAME Method 625 Acid Compounds
Date & Time Collected 07/16/84 Category

DATA FILE 2CU07093C03 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 4 DATE INJECTED 07/31/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

PAGE 13 Analytical Serv REPORT LAB # 84-07-093
RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 6G, Bldg 3001 FRACTION 03A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/16/84 Category

DATA FILE 2CU07093C03 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 4 DATE INJECTED 07/31/84 INSTRUMENT COMPOUNDS DETECTED 2

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B	1644	66B	bis(2-ethylhexyl)phthalate	12
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B	1829	69B	di-n-octyl phthalate	12
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

Analytical Serv REPORT
Results by Sample

RECEIVED: 07/18/84

LAB # 84-07-093
Continued From Above

SAMPLE ID 6G, Bldg 3001 FRACTION 03A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/16/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/l unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

Analytical Serv REPORT LAB # 84-07-093

RECEIVED: 07/18/84 Results by Sample

SAMPLE ID 6G, Bldg 3001 FRACTION 03B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/16/84 Category

DATA FILE 4CU07093V03 DATE INJECTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 3

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V	336	4V	benzene	47	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V		7V	chlorobenzene	ND	22V	127	44V	methylene chloride	21
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V	455	86V	toluene	670
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V		30V	1,2-trans-dichloroethylene	ND	31V		88V	vinyl chloride	ND

SAMPLE ID 6G, Bldg 3001 FRACTION 03B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/16/84 Category ______

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01C : DUP624
02C : DUP624
03C : DUP624

CORPORATION

PAGE 1 Analytical Serv REPORT LAB # 84-07-112
RECEIVED: 07/20/84 04/26/85 11:57:49

REPORT TO: Radian
Bl. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 4
COMPANY Tinker AFB
FACILITY

WORK ID wells, 601
TAKEN NS
TRANS Fed Ex
TYPE
P.O. # 212-027-21-05
INV. # 3856

PREPARED BY Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

Note: second column confirmation performed on all four samples on this work order.

Duplicate of report of 08/07/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

H-77

SAMPLE IDENTIFICATION

01 6A
02 6B
03 6C
04 7G

Analytical Serv TEST CODES and NAMES used on this report

GC 601 EPA Method 601/GC

CORPORATION

Analytical Serv REPORT LAB # 84-07-112

RECEIVED: 07/20/84 Results by Sample

SAMPLE ID 6A FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE 8 DATE INJECTED 07/25/84 ANALYST RGS MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 9

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	8	Trichloroethene	642
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	1.2		Bromoform	ND
2	1,1-Dichloroethene	1.7		1,1,2,2-Tetrachloroethane #	ND
3	1,1-Dichloroethane	1.4	9	Tetrachloroethylene #	4.7
4	trans-1,2-Dichloroethene	18.1		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
5	1,2-Dichloroethane	2.6		1,2-Dichlorobenzene	ND
6	1,1,1-Trichloroethane	4.2		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
7	1,2-Dichloropropane	0.3			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6A FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

RECEIVED: 07/20/84 Analytical Serv REPORT LAB # 84-07-112

Results by Sample

SAMPLE ID 6B FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC

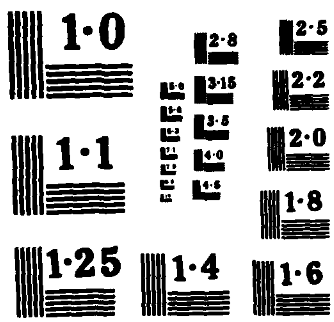
Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 07/25/84 ANALYST RGS VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 9

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	6	Trichloroethene	102
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
1	Methylene Chloride	0.9		2-Chloroethylvinyl Ether	ND
2	Trichlorofluoromethane	2.7		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
3	1,1-Dichloroethane	1.4	7	Tetrachloroethylene #	1.7
4	trans-1,2-Dichloroethene	33.2	8	Chlorobenzene	1.3
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND	9	1,2-Dichlorobenzene	1.1
5	1,1,1-Trichloroethane	0.2		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

AD-A162 911 INSTALLATION RESTORATION PROGRAM PHASE II 4/6
CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN
TX R W BAUER ET AL. OCT 85 RAD-85-212-027-21-03-VOL-2
UNCLASSIFIED F33615-83-D-4001 F/G 13/2 NL


1·0
1·1
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1·6
1·8
2·0
2·2
2·5
2·8
3·15
3·5
4·0
4·5

SAMPLE ID 6B FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601. (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

PAGE 6 Analytical Serv REPORT LAB # 84-07-112
RECEIVED: 07/20/84 Results by Sample

SAMPLE ID 6C FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 07/26/84 ANALYST RGS VERIFIED BY JSG
CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 6

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	5	Trichloroethene	4.9
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	3.9		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
2	1,1-Dichloroethane	0.3	6	Tetrachloroethylene #	0.7
3	trans-1,2-Dichloroethene	2.9		Chlorobenzene	ND
4	Chloroform	0.7		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6C FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

RECEIVED: 07/20/84 Analytical Serv REPORT LAB # 84-07-112

Results by Sample

SAMPLE ID 7G FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE 8 DATE INJECTED 07/26/84 ANALYST RGS VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 2

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	2	Trichloroethene	0.4
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	2.6		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

Analytical Serv REPORT
Results by Sample

LAB # 84-07-112
Continued From Above

RECEIVED: 07/20/84

SAMPLE ID 7G

FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601. (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

RECEIVED: 07/20/84 NonReported Work

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01B : DUP601
02B : DUP601
03B : DUP601
04B : DUP601

CORPORATION

Analytical Serv REPORT LAB # 84-07-113

RECEIVED: 07/20/84 04/26/85 11:59:17

REPORT TO	Radian Bl. 4 Austin	PREPARED BY	Radian Analytical Services 8501 MoPac Blvd. P.O. Box 9948 Austin, Texas 78766
ATTEN	William Little	ATTEN	
		PHONE	(512) 454-4797
CLIENT	TINKER SAMPLES 3		
COMPANY	Tinker AFB		
FACILITY			

CERTIFIED BY

CONTACT CONOVER

WORK ID	sediments
TAKEN	DG
TRANS	Fed Ex
TYPE	
P.O. #	212-027-21-05
INV. #	3907

Duplicate of report of 08/20/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

01	TSED-20
02	TSED-23
03	TSED-28

Analytical Serv TEST CODES and NAMES used on this report

AG E	Silver, ICPES
AS GA	Arsenic, low level
BA E	Barium, ICPES
CD E	Cadmium, ICPES
CNTOTA	Total Cyanide
CR E	Chromium, ICPES
CU E	Copper, ICPES
F IC	Fluoride, IC
H1RCRA	RCRA Herbicides
HG CA	Mercury, Cold Vapor
MN E	Manganese, ICPES
NI E	Nickel, ICPES
NO3 IC	Nitrate, IC
P1RCRA	RCRA Pesticides
PB GA	Lead, low level
PCB SS	PCBs in Soil
PHEN A	Total Phenolics
PH A	pH
PREP W	Special Digestion Method
PREP X	Special Digestion Method
SE GA	Selenium, low level
TOC	Total Organic Carbon
ZN E	Zinc, ICPES

CORPORATION

Analytical Serv REPORT

LAB # 84-07-113

RECEIVED: 07/20/84

RESULTS BY TEST

TEST CODE default units	Sample 01 (entered units)	Sample 02 (entered units)	Sample 03 (entered units)
AG_E ug/ml	<1 ug/g	<1 ug/g	<1 ug/g
AS_GA ug/ml	<.1 ug/g	<.1 ug/g	<.1 ug/g
BA_E ug/ml	230 ug/g	610 ug/g	110 ug/g
CD_E ug/ml	2.4 ug/g	0.97 ug/g	0.83 ug/g
CNTOTA mg/L	<.01	<.01	<.01
CR_E ug/ml	38 ug/g	30 ug/g	12 ug/g
CU_E ug/ml	15 ug/g	8.2 ug/g	5.0 ug/g
F_IC mg/L	8	33	2.5
HG_CA ug/ml	0.37 ug/g	0.23 ug/g	0.25 ug/g
MN_E ug/ml	470 ug/g	520 ug/g	250 ug/g
NI_E ug/ml	7.0 ug/g	8.5 ug/g	5.9 ug/g
NO3_IC mg/L	1.9	3.2	3.2
PB_GA ug/ml	55.8 ug/g	8.7 ug/g	8.1 ug/g
PCB_SS ug/g	0.036 ug Ar 1260/g	<0.025	<0.025

PHEN_A mg/L	<.01	<.01	<.01
PH_A pH_units	7.30	7.30	6.37
PREP_W date_complete	07/31/84	07/31/84	07/31/84
PREP_X date_complete	07/31/84	07/31/84	07/31/84
SE_GA ug/ml	<.002 ug/g	<.002 ug/g	<.002 ug/g
TOC mg/L	1.30 %	0.30 %	0.85 %
ZN_E ug/ml	53 ug/g	20 ug/g	8.3 ug/g

RECEIVED: 07/20/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-113

SAMPLE ID TSED-20 FRACTION 01B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 08/16/84
CONCENTRATION FACTOR 10

DATE INJECTED 08/18/84
ANALYST MSF

VERIFIED BY LLN

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	ND	1.0			
2,4,5-TP (Silvex)	ND	1.0			

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-20 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 08/13/84
CONCENTRATION FACTOR 10

DATE INJECTED 08/16/84
ANALYST MSF

VERIFIED BY LLN

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	ND	2.0			
Endrin	ND	2.0			
Methoxychlor	ND	20.			
Toxaphene	ND	20.			

NOTES AND DEFINITIONS FOR THIS REPORT.

SAMPLE ID TSED-20 FRACTION 01B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category ______

ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-23 FRACTION 02B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category ______

DATE EXTRACTED 08/16/84 DATE INJECTED 08/18/84 VERIFIED BY LLN
CONCENTRATION FACTOR 10 ANALYST SF

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	ND	1.0			
2,4,5-TP (Silvex)	ND	1.0			

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-23 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category ______

DATE EXTRACTED 08/13/84 DATE INJECTED 08/16/84 VERIFIED BY LLN
CONCENTRATION FACTOR 10 ANALYST MSF

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	ND	2.0			
Endrin	ND	2.0			
Methoxychlor	ND	20.			

SAMPLE ID TSED-23 FRACTION 02B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

Toxaphene	ND	20.

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-28 FRACTION 03B TEST CODE H1RCRA NAME RCRA Herbicides
Date & Time Collected not specified Category

DATE EXTRACTED 08/13/84 DATE INJECTED 08/16/84 VERIFIED BY LLN
CONCENTRATION FACTOR 10 ANALYST MSF

COMPOUND	RESULT	DET. LIMIT	OTHER HERBICIDES	RESULT	DET. LIMIT
2,4-D	ND	1.0			
2,4,5-TP (Silvex)	ND	1.0			

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

SAMPLE ID TSED-28 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

DATE EXTRACTED 08/13/84 DATE INJECTED 08/16/84 VERIFIED BY LLN
CONCENTRATION FACTOR 10 ANALYST MSF

RECEIVED: 07/20/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-113
Continued From Above

SAMPLE ID TSED-28 FRACTION 03B TEST CODE P1RCRA NAME RCRA Pesticides
Date & Time Collected not specified Category

COMPOUND	RESULT	DET. LIMIT	OTHER PESTICIDES	RESULT	DET. LIMIT
Lindane	ND	2.0			
Endrin	ND	2.0			
Methoxychlor	ND	20.			
Toxaphene	ND	20.			

NOTES AND DEFINITIONS FOR THIS REPORT.
ND = not detected at the specified detection limit.
All results reported in micrograms/liter unless otherwise specified.

CORPORATION

Analytical Serv REPORT LAB # 84-07-131

RECEIVED: 07/23/84 04/26/85 12:00:28

REPORT TO Radian
Bl. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 6
COMPANY Tinker AFB
FACILITY

WORK ID USAF, Well Water
TAKEN 7/18/84, Nancy Stein
TRANS federal express
TYPE H2O
P.O. # 212-027-21-05
INV. # 3908

PREPARED BY Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766
ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

Duplicate of report of 08/17/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

01 6A
02 6B
03 6C
04 7G

Analytical Serv TEST CODES and NAMES used on this report

M625 A Method 625 Acid Compounds
M625 B Method 625 Base/Neutrals
MS 624 EPA Method 624/GC-MS

CORPORATION

Analytical Serv REPORT LAB # 84-07-131

RECEIVED: 07/23/84 Results by Sample

SAMPLE ID 6A FRACTION 01A TEST CODE M625 A NAME Method 625 Acid Compounds

Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C01 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 07/30/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

RECEIVED: 07/23/84 Analytical Serv REPORT LAB # 84-07-131

Results by Sample

SAMPLE ID 6A FRACTION 01A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C01 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 07/30/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B		66B	bis(2-ethylhexyl)phthalate	ND
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B		69B	di-n-octyl phthalate	ND
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

Analytical Serv REPORT

LAB # 84-07-131

RECEIVED: 07/23/84

Results by Sample

Continued From Above

SAMPLE ID 6A FRACTION 01A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/18/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

Analytical Serv REPORT LAB # 84-07-131

RECEIVED: 07/23/84

Results by Sample

SAMPLE ID 6A FRACTION 01B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/18/84 Category

DATA FILE 4CU07131V01 DATE INJECTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 1

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V		4V	benzene	ND	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V		7V	chlorobenzene	ND	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V		86V	toluene	ND
16V		29V	1,1-dichloroethylene	ND	29V	313	87V	trichloroethylene	779
26V		30V	1,2-trans-dichloroethylene	ND	31V		88V	vinyl chloride	ND

RECEIVED: 07/23/84

Analytical Serv REPORT

Results by Sample

LAB # 84-07-131

Continued From Above

SAMPLE ID 6A

FRACTION 01B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/18/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

Analytical Serv REPORT LAB # 84-07-131

RECEIVED: 07/23/84 Results by Sample

SAMPLE ID 6B FRACTION 02A TEST CODE M625 A NAME Method 625 Acid Compounds
Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C02 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 2 DATE INJECTED 07/30/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

Analytical Serv REPORT LAB # 84-07-131

RECEIVED: 07/23/84 Results by Sample

SAMPLE ID 6B FRACTION 02A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C02 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 07/30/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B		66B	bis(2-ethylhexyl)phthalate	ND
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B		69B	di-n-octyl phthalate	ND
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

CORPORATION

RECEIVED: 07/23/84 | Analytical Serv REPORT | Results by Sample | LAB # 84-07-131 | Continued From Above

SAMPLE ID 6B | FRACTION 02A | TEST CODE M625 B | NAME Method 625 Base/Neutrals

Date & Time Collected 07/18/84 | Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

Analytical Serv REPORT LAB # 84-07-131

RECEIVED: 07/23/84

Results by Sample

SAMPLE ID 6B FRACTION 02B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/18/84 Category

DATA FILE 4CU07131V02 DATE INJECTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED. 2

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V		4V	benzene	ND	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V		7V	chlorobenzene	ND	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V		86V	toluene	ND
16V		29V	1,1-dichloroethylene	ND	29V	316	87V	trichloroethylene	134
26V	214	30V	1,2-trans-dichloroethylene	48	31V		88V	vinyl chloride	ND

CORPORATION

PAGE 11 Analytical Serv REPORT LAB # 84-07-131
RECEIVED: 07/23/84 Results by Sample Continued From Above

SAMPLE ID 6B FRACTION 02B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/18/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

CORPORATION

PAGE 12 Analytical Serv REPORT LAB # 84-07-131
RECEIVED: 07/23/84 Results by Sample

SAMPLE ID 6C FRACTION 03A TEST CODE M625 A NAME Method 625 Acid Compounds
Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C03 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 2 DATE INJECTED 07/30/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

RECEIVED: 07/23/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-131

SAMPLE ID 6C

FRACTION 03A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C03 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 2 DATE INJECTED 07/30/84 INSTRUMENT COMPOUNDS DETECTED 1

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B		66B	bis(2-ethylhexyl)phthalate	ND
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B	1840	69B	di-n-octyl phthalate	44
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

Analytical Serv REPORT
Results by Sample

LAB # 84-07-131
Continued From Above

SAMPLE ID 6C

FRACTION 03A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/18/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.nzene ND

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

BCM CORPORATION

RECEIVED: 07/23/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-131

SAMPLE ID 6C

FRACTION 03B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/18/84 Category

DATA FILE 4CU07131V03 DATE INJECTED 07/25/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V		4V	benzene	ND	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V		7V	chlorobenzene	ND	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V		86V	toluene	ND
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V		30V	1,2-trans-dichloroethylene	ND	31V		88V	vinyl chloride	ND

RECEIVED: 07/23/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-131
Continued From Above

SAMPLE ID 6C

FRACTION 03B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/18/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

CORPORATION

RECEIVED: 07/23/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-131

SAMPLE ID 7G

FRACTION 04A TEST CODE M625 A NAME Method 625 Acid Compounds
Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C04
CONC. FACTOR 2

DATE EXTRACTED 07/25/84
DATE INJECTED 07/30/84

ANALYST BWS
INSTRUMENT

VERIFIED BY LAK
COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

RECEIVED: 07/23/84

Analytical Serv REPORT LAB # 84-07-131

Results by Sample

SAMPLE ID 7G

FRACTION 04A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/18/84 Category

DATA FILE 2CU07131C04 DATE EXTRACTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 07/30/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B		66B	bis(2-ethylhexyl)phthalate	ND
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B		69B	di-n-octyl phthalate	ND
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

CORPORATION

RECEIVED: 07/23/84

Analytical Serv REPORT
Results by Sample

LAB # 84-07-131
Continued From Above

SAMPLE ID 7G

FRACTION 04A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/18/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT. nzene ND

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

Analytical Serv REPORT LAB # 84-07-131

RECEIVED: 07/23/84 Results by Sample

SAMPLE ID 7G FRACTION 04B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/18/84 Category

DATA FILE 4CU07131V04 DATE INJECTED 07/25/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
1V	2V	acrolein	ND	17V	32V	1,2-dichloropropane	ND
2V	3V	acrylonitrile	ND	18V	33V	cis-1,3-dichloropropylene	ND
3V	4V	benzene	ND	18V	33V	trans-1,3-dichloropropylene	ND
6V	6V	carbon tetrachloride	ND	19V	38V	ethylbenzene	ND
7V	7V	chlorobenzene	ND	22V	44V	methylene chloride	ND
15V	10V	1,2-dichloroethane	ND	21V	45V	methyl chloride	ND
27V	11V	1,1,1-trichloroethane	ND	20V	46V	methyl bromide	ND
14V	13V	1,1-dichloroethane	ND	5V	47V	bromoform	ND
28V	14V	1,1,2-trichloroethane	ND	12V	48V	dichlorobromomethane	ND
23V	15V	1,1,2,2-tetrachloroethane	ND	30V	49V	trichlorofluoromethane	ND
9V	16V	chloroethane	ND	13V	50V	dichlorodifluoromethane	ND
4V	17V	bis (chloromethyl) ether	ND	8V	51V	chlorodibromomethane	ND
10V	19V	2-chloroethylvinyl ether	ND	24V	85V	tetrachloroethylene	ND
11V	23V	chloroform	ND	25V	86V	toluene	ND
16V	29V	1,1-dichloroethylene	ND	29V	87V	trichloroethylene	ND
26V	30V	1,2-trans-dichloroethylene	ND	31V	88V	vinyl chloride	ND

SAMPLE ID 7G FRACTION 04B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/18/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01C : DUP624
02C : DUP624
03C : DUP624
04C : DUP624

CORPORATION

PAGE 1 Analytical Serv REPORT LAB # 84-08-003
RECEIVED: 08/01/84 04/26/85 12:03:31

REPORT TO Radian
Bl. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 9
COMPANY Tinker AFB
FACILITY

WORK ID monitor wells, 601
TAKEN NS, DG
TRANS Fed Ex
TYPE
P.O. # 212-027-21-05
INV. # 3910

PREPARED BY Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766
ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

Note: second column confirmation performed on samples 2A, 6C, 6D, 6G, 7F.

Duplicate of report of 08/16/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

H-118

SAMPLE IDENTIFICATION

01 2A
02 6C
03 6D
04 6E
05 6F
06 6G
07 7A
08 7C
09 7F

Analytical Serv TEST CODES and NAMES used on this report

GC 601 EPA Method 601/GC

CORPORATION

PAGE 2 Analytical Serv REPORT LAB # 84-08-003

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 2A FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/08/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 8

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	7	Trichloroethene	61.0
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
1	Methylene Chloride	11.5		2-Chloroethylvinyl Ether	ND
2	Trichlorofluoromethane	12.2		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
3	1,1-Dichloroethane	29.9	8	Tetrachloroethylene #	22.5
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
4	Chloroform	7.8		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
5	1,1,1-Trichloroethane	3.5		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
6	1,2-Dichloropropane	0.6			
	trans-1,3-Dichloropropene	ND			

CORPORATION

RECEIVED: 08/01/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-003
Continued From Above

SAMPLE ID 2A

FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

PAGE 4 Analytical Serv REPORT LAB # 84-08-003

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6C FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/08/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 6

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	5	Trichloroethene	3.1
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	0.4		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
2	1,1-Dichloroethane	0.2	6	Tetrachloroethylene #	0.2
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
3	Chloroform	1.6		1,3-Dichlorobenzene	ND
4	1,2-Dichloroethane	0.3		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6C FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category ______

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

Analytical Serv REPORT LAB # 84-08-003

RECEIVED: 08/01/84

Results by Sample

SAMPLE ID 6D FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/08/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 4

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	22.0		Bromoform	ND
2	1,1-Dichloroethene	2.0		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND	3	Chlorobenzene	21.8
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND	4	1,2-Dichlorobenzene	11.0
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

Analytical Serv REPORT

Results by Sample

LAB # 84-08-003

Continued From Above

RECEIVED: 08/01/84

SAMPLE ID 6D

FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

PAGE 8 Analytical Serv REPORT LAB # 84-08-003
RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6E FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE 8 DATE INJECTED 08/09/84 ANALYST MCL VERIFIED BY JSG
CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 0

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

Analytical Serv REPORT
LAB # 84-08-003
RECEIVED: 08/01/84
Results by Sample
Continued From Above

SAMPLE ID 6E

FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

Analytical Serv REPORT LAB # 84-08-003

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6F FRACTION 05A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/09/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 2

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	2	Trichloroethene	0.1
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	0.5		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6F FRACTION 05A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

RECEIVED: 08/01/84 Analytical Serv REPORT LAB # 84-08-003

Results by Sample

SAMPLE ID 6G FRACTION 06A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/09/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 3

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	3	Trichloroethene	0.9
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	1.7		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
2	Chloroform	3.8		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6G FRACTION 06A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

RECEIVED: 08/01/84

Analytical Serv REPORT LAB # 84-08-003

Results by Sample

SAMPLE ID 7A FRACTION 07A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/09/84 ANALYST RGS VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 1

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	2.2		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

RECEIVED: 08/01/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-003
Continued From Above

SAMPLE ID 7A
FRACTION 07A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

RECEIVED: 08/01/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-003

SAMPLE ID 7C

FRACTION 08A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE B
CONC. FACTOR

DATE INJECTED 08/09/84

ANALYST RGS
INSTRUMENT b

VERIFIED BY JSG
COMPOUNDS DETECTED 1

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	0.5		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 7C FRACTION 08A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

Analytical Serv REPORT LAB # 84-08-003
RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 7F FRACTION 09A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/09/84 ANALYST RGS VERIFIED BY JSG
CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 6

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	4	Trichloroethene	0.6
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
1	Chloroethane	13.3		cis-1,3-Dichloropropene *	ND
2	Methylene Chloride	6.8		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND	5	Chlorobenzene	4.5
3	Chloroform	19.2		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND	6	1,2-Dichlorobenzene	6.5
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

CORPORATION

Analytical Serv REPORT
LAB # 84-08-003
RECEIVED: 08/01/84
Results by Sample
Continued From Above

SAMPLE ID 7F FRACTION 09A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01B : DUP601
02B : DUP601
03B : DUP601
04B : DUP601
05B : DUP601
06B : DUP601
07B : DUP601
C8B : DUP601
09B : DUP601

RADIAN CORPORATION

PAGE 1 Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 04/26/85 12:06:04

REPORT TO: Radian
B1. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 6
COMPANY Tinker AFB
FACILITY

WORK ID Monitoring Wells
TAKEN NS/DHG
TRANS federal express
TYPE H2O
P.O. # 212-027-21-05
INV. # 3911

PREPARED BY: Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

Duplicate of report of 08/17/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

01 6D
02 6E
03 6F
04 6G
05 7A
06 7C

Analytical Serv TEST CODES and NAMES used on this report

M625 A Method 625 Acid Compounds
M625 B Method 625 Base/Neutrals
MS 624 EPA Method 624/GC-MS

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84

Results by Sample

SAMPLE ID 6D

FRACTION 01A TEST CODE M625 A NAME Method 625 Acid Compounds

Date & Time Collected 07/31/84 Category

DATA FILE 2CU08013C01 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

RECEIVED: 08/01/84

Analytical Serv REPORT LAB # 84-08-013

Results by Sample

SAMPLE ID 6D FRACTION 01A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/31/84 Category

DATA FILE 2CU08013C01 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
1B	1B	acenaphthene	ND	41B	61B	N-nitrosodimethylamine	ND
4B	5B	benzidine	ND	43B	62B	N-nitrosodiphenylamine	ND
46B	8B	1,2,4-trichlorobenzene	ND	42B	63B	N-nitrosodi-n-propylamine	ND
33B	9B	hexachlorobenzene	ND	13B	66B	bis(2-ethylhexyl)phthalate	ND
36B	12B	hexachloroethane	ND	15B	67B	butyl benzyl phthalate	ND
11B	18B	bis(2-chloroethyl)ether	ND	26B	68B	di-butyl phthalate	ND
16B	20B	2-chloronaphthalene	ND	29B	69B	di-n-octyl phthalate	ND
20B	25B	1,2-dichlorobenzene	ND	24B	70B	diethyl phthalate	ND
21B	26B	1,3-dichlorobenzene	ND	25B	71B	dimethyl phthalate	ND
22B	27B	1,4-dichlorobenzene	ND	5B	72B	benzo(a)anthracene A	ND
23B	28B	3,3'dichlorobenzidine	ND	6B	73B	benzo(a)pyrene	ND
27B	35B	2,4-dinitrotoluene	ND	7B	74B	benzo(b)fluoranthene *	ND
28B	36B	2,6-dinitrotoluene	ND	9B	75B	benzo(k)fluoranthene *	ND
29B	37B	1,2-diphenylhydrazine	ND	18B	76B	chrysene A	ND
31B	39B	fluoranthene	ND	2B	77B	acenaphthylene	ND
17B	40B	4-chlorophenyl phenyl ether	ND	3B	78B	anthracene B	ND

RECEIVED: 08/01/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-013
Continued From Above

SAMPLE ID 6D FRACTION 01A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/31/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

RECEIVED: 08/01/84

Analytical Serv REPORT LAB # 84-08-013

Results by Sample

SAMPLE ID 6D FRACTION 01B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/31/84 Category

DATA FILE 4CU08013V01 DATE INJECTED 08/02/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 1

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V		4V	benzene	ND	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V	475	7V	chlorobenzene	30	22V		44V	methylene chloride	ND
5V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V		86V	toluene	ND
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V		30V	1,2-trans-dichloroethylene	ND	31V		88V	vinyl chloride	ND

Analytical Serv REPORT

Results by Sample

LAB # 84-08-013

RECEIVED: 08/01/84

Continued From Above

SAMPLE ID 6D

FRACTION 01B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/31/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/l unless otherwise specified.

ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6E FRACTION 02A TEST CODE M625 A NAME Method 625 Acid Compounds

Date & Time Collected 07/30/84 Category

DATA FILE 2CU08013C02 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84

Results by Sample

SAMPLE ID 6E FRACTION 02A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/30/84 Category

DATA FILE 2CU08013C01 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
1B	1B	acenaphthene	ND	41B	61B	N-nitrosodimethylamine	ND
4B	5B	benzidine	ND	43B	62B	N-nitrosodiphenylamine	ND
46B	8B	1,2,4-trichlorobenzene	ND	42B	63B	N-nitrosodi-n-propylamine	ND
33B	9B	hexachlorobenzene	ND	13B	66B	bis(2-ethylhexyl)phthalate	ND
36B	12B	hexachloroethane	ND	15B	67B	butyl benzyl phthalate	ND
11B	18B	bis(2-chloroethyl)ether	ND	26B	68B	di-butyl phthalate	ND
16B	20B	2-chloronaphthalene	ND	29B	69B	di-n-octyl phthalate	ND
20B	25B	1,2-dichlorobenzene	ND	24B	70B	diethyl phthalate	ND
21B	26B	1,3-dichlorobenzene	ND	25B	71B	dimethyl phthalate	ND
22B	27B	1,4-dichlorobenzene	ND	5B	72B	benzo(a)anthracene A	ND
23B	28B	3,3'dichlorobenzidine	ND	6B	73B	benzo(a)pyrene	ND
27B	35B	2,4-dinitrotoluene	ND	7B	74B	benzo(b)fluoranthene *	ND
28B	36B	2,6-dinitrotoluene	ND	9B	75B	benzo(k)fluoranthene *	ND
29B	37B	1,2-diphenylhydrazine	ND	18B	76B	chrysene A	ND
31B	39B	fluoranthene	ND	2B	77B	acenaphthylene	ND
17B	40B	4-chlorophenyl phenyl ether	ND	3B	78B	anthracene B	ND

SAMPLE ID 6E FRACTION 02A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/30/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6E FRACTION 02B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/30/84 Category

DATA FILE 4CU08013V02 DATE INJECTED 08/02/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 1

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V		4V	benzene	ND	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V		7V	chlorobenzene	ND	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V	453	86V	toluene	61
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V		30V	1,2-trans-dichloroethylene	ND	31V		88V	vinyl chloride	ND

SAMPLE ID 6E FRACTION 02B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/30/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

CORPORATION

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6F FRACTION 03A TEST CODE M625 A NAME Method 625 Acid Compounds

Date & Time Collected 07/30/84 Category

DATA FILE 2CU08013C03 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
11A		21A	2,4,6-trichlorophenol	ND	7A		58A	4-nitrophenol	ND
8A		22A	4-chloro-3-methylphenol	ND	5A		59A	2,4-dinitrophenol	ND
1A		24A	2-chlorophenol	ND	4A		60A	2-methyl-4,6-dinitrophenol	ND
2A		31A	2,4-dichlorophenol	ND	9A		64A	pentachlorophenol	ND
3A		34A	2,4-dimethylphenol	ND	10A		65A	phenol	ND
6A		57A	2-nitrophenol	ND					

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84

Results by Sample

SAMPLE ID 6F FRACTION 03A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/30/84 Category

DATA FILE 2CU08013C03 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B		66B	bis(2-ethylhexyl)phthalate	ND
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B		69B	di-n-octyl phthalate	ND
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

SAMPLE ID 6F FRACTION 03A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/30/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		NOTES AND DEFINITIONS FOR THIS REPORT. nzene	ND				

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

PAGE 15 Analytical Serv REPORT LAB # 84-08-013
RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6F FRACTION 03B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/30/84 Category

DATA FILE 4CU08013V03 DATE INJECTED 08/02/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
1V	2V	acrolein	ND	17V	32V	1,2-dichloropropane	ND
2V	3V	acrylonitrile	ND	18V	33V	cis-1,3-dichloropropylene	ND
3V	4V	benzene	ND	18V	33V	trans-1,3-dichloropropylene	ND
6V	6V	carbon tetrachloride	ND	19V	38V	ethylbenzene	ND
7V	7V	chlorobenzene	ND	22V	44V	methylene chloride	ND
15V	10V	1,2-dichloroethane	ND	21V	45V	methyl chloride	ND
27V	11V	1,1,1-trichloroethane	ND	20V	46V	methyl bromide	ND
14V	13V	1,1-dichloroethane	ND	5V	47V	bromoform	ND
28V	14V	1,1,2-trichloroethane	ND	12V	48V	dichlorobromomethane	ND
23V	15V	1,1,2,2-tetrachloroethane	ND	30V	49V	trichlorofluoromethane	ND
9V	16V	chloroethane	ND	13V	50V	dichlorodifluoromethane	ND
4V	17V	bis (chloromethyl) ether	ND	8V	51V	chlorodibromomethane	ND
10V	19V	2-chloroethylvinyl ether	ND	24V	85V	tetrachloroethylene	ND
11V	23V	chloroform	ND	25V	86V	toluene	ND
16V	29V	1,1-dichloroethylene	ND	29V	87V	trichloroethylene	ND
26V	30V	1,2-trans-dichloroethylene	ND	31V	88V	vinyl chloride	ND

SAMPLE ID 6F FRACTION 03B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/30/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6G FRACTION 04A TEST CODE M625 A NAME Method 625 Acid Compounds

Date & Time Collected 07/30/84 Category

DATA FILE 2CU08013C04 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

PAGE 18 Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6G FRACTION 04A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/30/84 Category

DATA FILE 2CU08013C04 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
1B	1B	acenaphthene	ND	41B	61B	N-nitrosodimethylamine	ND
4B	5B	benzidine	ND	43B	62B	N-nitrosodiphenylamine	ND
46B	8B	1,2,4-trichlorobenzene	ND	42B	63B	N-nitrosodi-n-propylamine	ND
33B	9B	hexachlorobenzene	ND	13B	66B	bis(2-ethylhexyl)phthalate	ND
36B	12B	hexachloroethane	ND	15B	67B	butyl benzyl phthalate	ND
11B	18B	bis(2-chloroethyl)ether	ND	26B	68B	di-butyl phthalate	ND
16B	20B	2-chloronaphthalene	ND	29B	69B	di-n-octyl phthalate	ND
20B	25B	1,2-dichlorobenzene	ND	24B	70B	diethyl phthalate	ND
21B	26B	1,3-dichlorobenzene	ND	25B	71B	dimethyl phthalate	ND
22B	27B	1,4-dichlorobenzene	ND	5B	72B	benzo(a)anthracene A	ND
23B	28B	3,3'dichlorobenzidine	ND	6B	73B	benzo(a)pyrene	ND
27B	35B	2,4-dinitrotoluene	ND	7B	74B	benzo(b)fluoranthene *	ND
28B	36B	2,6-dinitrotoluene	ND	9B	75B	benzo(k)fluoranthene *	ND
29B	37B	1,2-diphenylhydrazine	ND	18B	76B	chrysene A	ND
31B	39B	fluoranthene	ND	2B	77B	acenaphthylene	ND
17B	40B	4-chlorophenyl phenyl ether	ND	3B	78B	anthracene B	ND

Analytical Serv REPORT
Results by Sample

LAB # 84-08-013
Continued From Above

RECEIVED: 08/01/84

SAMPLE ID 6G FRACTION 04A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/30/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 6G FRACTION 04B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/30/84 Category

DATA FILE 4CU08013V04 DATE INJECTED 08/02/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 3

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V	327	4V	benzene	39	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V		7V	chlorobenzene	ND	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V	448	86V	toluene	1886
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V	193	30V	1,2-trans-dichloroethylene	11	31V		88V	vinyl chloride	ND

Analytical Serv REPORT
Results by Sample

LAB # 84-08-013
Continued From Above

RECEIVED: 08/01/84

SAMPLE ID 6G

FRACTION 04B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/30/84 Category ______

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

CORPORATION

Analytical Serv REPORT
Results by Sample

LAB # 84-08-013

RECEIVED: 08/01/84

SAMPLE ID 7A

FRACTION 05A TEST CODE M625 A NAME Method 625 Acid Compounds
Date & Time Collected 07/31/84 Category

DATA FILE 2CU08013C01 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

CORPORATION

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 7A FRACTION 05A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/31/84 Category

DATA FILE 2CU08013V05 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
1B	1B	acenaphthene	ND	41B	61B	N-nitrosodimethylamine	ND
4B	5B	benzidine	ND	43B	62B	N-nitrosodiphenylamine	ND
46B	8B	1,2,4-trichlorobenzene	ND	42B	63B	N-nitrosodi-n-propylamine	ND
33B	9B	hexachlorobenzene	ND	13B	66B	bis(2-ethylhexyl)phthalate	ND
36B	12B	hexachloroethane	ND	15B	67B	butyl benzyl phthalate	ND
11B	18B	bis(2-chloroethyl)ether	ND	26B	68B	di-butyl phthalate	ND
16B	20B	2-chloronaphthalene	ND	29B	69B	di-n-octyl phthalate	ND
20B	25B	1,2-dichlorobenzene	ND	24B	70B	diethyl phthalate	ND
21B	26B	1,3-dichlorobenzene	ND	25B	71B	dimethyl phthalate	ND
22B	27B	1,4-dichlorobenzene	ND	5B	72B	benzo(a)anthracene A	ND
23B	28B	3,3'dichlorobenzidine	ND	6B	73B	benzo(a)pyrene	ND
27B	35B	2,4-dinitrotoluene	ND	7B	74B	benzo(b)fluoranthene *	ND
28B	36B	2,6-dinitrotoluene	ND	9B	75B	benzo(k)fluoranthene *	ND
29B	37B	1,2-diphenylhydrazine	ND	18B	76B	chrysene A	ND
31B	39B	fluoranthene	ND	2B	77B	acenaphthylene	ND
17B	40B	4-chlorophenyl phenyl ether	ND	3B	78B	anthracene B	ND

CORPORATION

RECEIVED: 08/01/84 Analytical Serv REPORT Results by Sample LAB # 84-08-013 Continued From Above

SAMPLE ID 7A FRACTION 05A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/31/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = benzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

RECEIVED: 08/01/84

Analytical Serv REPORT LAB # 84-08-013

Results by Sample

SAMPLE ID 7A FRACTION 05B TEST CODE MS 624 NAME EPA Method 624/GC-MS

Date & Time Collected 07/31/84 Category

DATA FILE 4CU08013V05 DATE INJECTED 08/02/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 1

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1V		2V	acrolein	ND	17V		32V	1,2-dichloropropane	ND
2V		3V	acrylonitrile	ND	18V		33V	cis-1,3-dichloropropylene	ND
3V		4V	benzene	ND	18V		33V	trans-1,3-dichloropropylene	ND
6V		6V	carbon tetrachloride	ND	19V		38V	ethylbenzene	ND
7V		7V	chlorobenzene	ND	22V		44V	methylene chloride	ND
15V		10V	1,2-dichloroethane	ND	21V		45V	methyl chloride	ND
27V		11V	1,1,1-trichloroethane	ND	20V		46V	methyl bromide	ND
14V		13V	1,1-dichloroethane	ND	5V		47V	bromoform	ND
28V		14V	1,1,2-trichloroethane	ND	12V		48V	dichlorobromomethane	ND
23V		15V	1,1,2,2-tetrachloroethane	ND	30V		49V	trichlorofluoromethane	ND
9V		16V	chloroethane	ND	13V		50V	dichlorodifluoromethane	ND
4V		17V	bis (chloromethyl) ether	ND	8V		51V	chlorodibromomethane	ND
10V		19V	2-chloroethylvinyl ether	ND	24V		85V	tetrachloroethylene	ND
11V		23V	chloroform	ND	25V	449	86V	toluene	6
16V		29V	1,1-dichloroethylene	ND	29V		87V	trichloroethylene	ND
26V		30V	1,2-trans-dichloroethylene	ND	31V		88V	vinyl chloride	ND

SAMPLE ID 7A FRACTION 05B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/31/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/l unless otherwise specified.

ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

Analytical Serv REPORT LAB # 84-08-013

RECEIVED: 08/01/84 Results by Sample

SAMPLE ID 7C FRACTION 06A TEST CODE M625 A NAME Method 625 Acid Compounds

Date & Time Collected 07/31/84 Category

DATA FILE 2CU08013C06 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK

CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
11A	21A	2,4,6-trichlorophenol	ND	7A	58A	4-nitrophenol	ND
8A	22A	4-chloro-3-methylphenol	ND	5A	59A	2,4-dinitrophenol	ND
1A	24A	2-chlorophenol	ND	4A	60A	2-methyl-4,6-dinitrophenol	ND
2A	31A	2,4-dichlorophenol	ND	9A	64A	pentachlorophenol	ND
3A	34A	2,4-dimethylphenol	ND	10A	65A	phenol	ND
6A	57A	2-nitrophenol	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

RECEIVED: 08/01/84

Analytical Serv REPORT LAB # 84-08-013

Results by Sample

SAMPLE ID 7C

FRACTION 06A TEST CODE M625 B NAME Method 625 Base/Neutrals

Date & Time Collected 07/31/84 Category

DATA FILE 2CU08013C06 DATE EXTRACTED 08/01/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 2 DATE INJECTED 08/06/84 INSTRUMENT COMPOUNDS DETECTED 0

NPDES	SCAN	EPA	COMPOUND	RESULT	NPDES	SCAN	EPA	COMPOUND	RESULT
1B		1B	acenaphthene	ND	41B		61B	N-nitrosodimethylamine	ND
4B		5B	benzidine	ND	43B		62B	N-nitrosodiphenylamine	ND
46B		8B	1,2,4-trichlorobenzene	ND	42B		63B	N-nitrosodi-n-propylamine	ND
33B		9B	hexachlorobenzene	ND	13B		66B	bis(2-ethylhexyl)phthalate	ND
36B		12B	hexachloroethane	ND	15B		67B	butyl benzyl phthalate	ND
11B		18B	bis(2-chloroethyl)ether	ND	26B		68B	di-butyl phthalate	ND
16B		20B	2-chloronaphthalene	ND	29B		69B	di-n-octyl phthalate	ND
20B		25B	1,2-dichlorobenzene	ND	24B		70B	diethyl phthalate	ND
21B		26B	1,3-dichlorobenzene	ND	25B		71B	dimethyl phthalate	ND
22B		27B	1,4-dichlorobenzene	ND	5B		72B	benzo(a)anthracene A	ND
23B		28B	3,3'dichlorobenzidine	ND	6B		73B	benzo(a)pyrene	ND
27B		35B	2,4-dinitrotoluene	ND	7B		74B	benzo(b)fluoranthene *	ND
28B		36B	2,6-dinitrotoluene	ND	9B		75B	benzo(k)fluoranthene *	ND
29B		37B	1,2-diphenylhydrazine	ND	18B		76B	chrysene A	ND
31B		39B	fluoranthene	ND	2B		77B	acenaphthylene	ND
17B		40B	4-chlorophenyl phenyl ether	ND	3B		78B	anthracene B	ND

RECEIVED: 08/01/84 Results by Sample Continued From Above

SAMPLE ID 7C FRACTION 06A TEST CODE M625 B NAME Method 625 Base/Neutrals
Date & Time Collected 07/31/84 Category

14B	41B	4-bromophenyl phenyl ether	ND	8B	79B	benzo(ghi)perylene	ND
12B	42B	bis(2-chloroisopropyl)ether	ND	32B	80B	fluorene	ND
10B	43B	bis(2-chloroethoxy)methane	ND	44B	81B	phenanthrene B	ND
34B	52B	hexachlorobutadiene	ND	19B	82B	dibenzo(a,h)anthracene	ND
35B	53B	hexachlorocyclopentadiene	ND	37B	83B	indeno(1,2,3-cd)pyrene	ND
38B	54B	isophorone	ND	45B	84B	pyrene	ND
39B	55B	naphthalene	ND				
		nzene	ND				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified.

ND = not detected at EPA detection limit method 625, (Federal Register, 11/26/84).

* = henzo(b)fluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthraccne and chrysene co-elute in high concentrations.

B = anthracene and phenanthrene co-elute in high concentrations.

CORPORATION

RECEIVED: 08/01/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-013

SAMPLE ID 7C

FRACTION 06B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/31/84 Category

DATA FILE 4CU08013V06 DATE INJECTED 08/02/84 ANALYST BWS VERIFIED BY LAK
CONC. FACTOR 1 INSTRUMENT f4 COMPOUNDS DETECTED 0

NPDES SCAN	EPA	COMPOUND	RESULT	NPDES SCAN	EPA	COMPOUND	RESULT
1V	2V	acrolein	ND	17V	32V	1,2-dichloropropane	ND
2V	3V	acrylonitrile	ND	18V	33V	cis-1,3-dichloropropylene	ND
3V	4V	benzene	ND	18V	33V	trans-1,3-dichloropropylene	ND
6V	6V	carbon tetrachloride	ND	19V	38V	ethylbenzene	ND
7V	7V	chlorobenzene	ND	22V	44V	methylene chloride	ND
15V	10V	1,2-dichloroethane	ND	21V	45V	methyl chloride	ND
27V	11V	1,1,1-trichloroethane	ND	20V	46V	methyl bromide	ND
14V	13V	1,1-dichloroethane	ND	5V	47V	bromoform	ND
28V	14V	1,1,2-trichloroethane	ND	12V	48V	dichlorobromomethane	ND
23V	15V	1,1,2,2-tetrachloroethane	ND	30V	49V	trichlorofluoromethane	ND
9V	16V	chloroethane	ND	13V	50V	dichlorodifluoromethane	ND
4V	17V	bis (chloromethyl) ether	ND	8V	51V	chlorodibromomethane	ND
10V	19V	2-chloroethylvinyl ether	ND	24V	85V	tetrachloroethylene	ND
11V	23V	chloroform	ND	25V	86V	toluene	ND
16V	29V	1,1-dichloroethylene	ND	29V	87V	trichloroethylene	ND
26V	30V	1,2-trans-dichloroethylene	ND	31V	88V	vinyl chloride	ND

Analytical Serv REPORT
Results by Sample

LAB # 84-08-013
Continued From Above

RECEIVED: 08/01/84

SAMPLE ID 7C

FRACTION 06B TEST CODE MS 624 NAME EPA Method 624/GC-MS
Date & Time Collected 07/31/84 Category

NOTES AND DEFINITIONS FOR THIS REPORT.
SCAN = scan number or retention time on chromatogram.
All results reported in ug/l unless otherwise specified.
ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01C : DUP624
02C : DUP624
03C : DUP624
04C : DUP624
05C : DUP624
06C : DUP624

CORPORATION

PAGE 1 | Analytical Serv | REPORT | LAB # 84-08-020

RECEIVED: 08/02/84 | 04/26/85 12:10:29

REPORT TO: Radian
Bl. 4
Austin

ATTEN: William Little

CLIENT: TINKER
SAMPLES: 5
COMPANY: Tinker AFB
FACILITY:

WORK ID: wells, 601
TAKEN: NS
TRANS: Fed Ex
TYPE:
P.O. #: 212-027-21-05
INV. #: 3912

PREPARED BY: Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN:
PHONE: (512) 454-4797

CERTIFIED BY: J. Steve Tilber

CONTACT: CONOVER

Note: second column confirmation performed on samples 6A, 6B, 6D, 6G.

Duplicate of report of 08/16/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

01 6A
02 6B
03 6D
04 6G
05 7G

Analytical Serv TEST CODES and NAMES used on this report

GC 601 EPA Method 601/GC

CORPORATION

PAGE 2 Analytical Serv REPORT LAB # 84-08-020
RECEIVED: 08/02/84 Results by Sample

SAMPLE ID 6A FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE A DATE INJECTED 08/09/84 ANALYST RAM VERIFIED BY JSG
CONC. FACTOR INSTRUMENT a COMPOUNDS DETECTED 9

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	8	Trichloroethene	444
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
1	Methylene Chloride	1.4		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
2	1,1-Dichloroethene	0.8	9	1,1,2,2-Tetrachloroethane #	2.7
3	1,1-Dichloroethane	1.3		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
4	Chloroform	9.9		1,3-Dichlorobenzene	ND
5	1,2-Dichloroethane	2.0		1,2-Dichlorobenzene	ND
6	1,1,1-Trichloroethane	2.5		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
7	1,2-Dichloropropane	0.2			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6A FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

RECEIVED: 08/02/84

Analytical Serv REPORT LAB # 84-08-020

Results by Sample

SAMPLE ID 6B

FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/09/84 ANALYST RAM VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 2

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	2	Trichloroethene	52.8
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
1	Chloroform	19.6		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6B FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

Analytical Serv REPORT LAB # 84-08-020

RECEIVED: 08/02/84 Results by Sample

SAMPLE ID 6D FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE B DATE INJECTED 08/09/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT b COMPOUNDS DETECTED 5

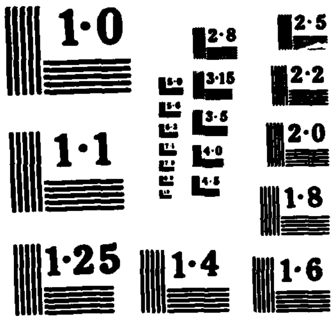
SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	3	Trichloroethene	0.5
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
1	1,1-Dichloroethane	1.8		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND	4	Chlorobenzene	34.5
2	Chloroform	0.8		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND	5	1,2-Dichlorobenzene	10.3
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6D FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

AD-A162 911 INSTALLATION RESTORATION PROGRAM PHASE II 5/6
CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN
TX R W BAUER ET AL. OCT 85 RAD-85-212-027-21-03-VOL-2
UNCLASSIFIED F33615-83-D-4001 F/G 13/2 NL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2.8
2.5
3.15
2.2
3.5
2.0
1.1
4.0
4.5
1.8
1.25
1.4
1.6

Analytical Serv REPORT LAB # 84-08-020

RECEIVED: 08/02/84

Results by Sample

SAMPLE ID 6G FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE A DATE INJECTED 08/09/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT a COMPOUNDS DETECTED 4

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	4	Trichloroethene	0.6
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
1	Chloroethane	0.6		cis-1,3-Dichloropropene *	ND
2	Methylene Chloride	0.6		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
3	Chloroform	1.6		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6G FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

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RECEIVED: 08/02/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-020

SAMPLE ID 7G

FRACTION 05A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE B
CONC. FACTOR

DATE INJECTED 08/10/84

ANALYST MCL
INSTRUMENT b

VERIFIED BY JSG
COMPOUNDS DETECTED 0

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 7G FRACTION 05A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

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Analytical Serv REPORT

LAB # 84-08-020

RECEIVED: 08/02/84

NonReported Work

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01B : DUP601
02B : DUP601
03B : DUP601
04B : DUP601
05B : DUP601

CORPORATION

PAGE 1 Analytical Serv REPORT LAB # 84-08-167
RECEIVED: 08/16/84 04/26/85 12:12:00

REPORT TO Radian
BI. 4
Austin

ATTEN William Little

CLIENT TINKER SAMPLES 5
COMPANY Tinker AFB
FACILITY

WORK ID 601
TAKEN DG
TRANS Fed Ex
TYPE
P.O. # 212-027-21-05
INV. # 4075

PREPARED BY Radian Analytical Services
8501 MoPac Blvd.
P.O. Box 9948
Austin, Texas 78766

ATTEN
PHONE (512) 454-4797

CERTIFIED BY

CONTACT CONOVER

Note: Second column confirmation performed on Split 4A.

Duplicate of report of 09/05/84.

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

H-182

SAMPLE IDENTIFICATION

01 6E
02 6F
03 7C, 8/14
04 7A
05 7C, 8/15

Analytical Serv TEST CODES and NAMES used on this report

GC 601 EPA Method 601/GC

CORPORATION

RECEIVED: 08/16/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-167

SAMPLE ID 6E

FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE A
CONC. FACTOR

DATE INJECTED 08/23/84

ANALYST MCL
INSTRUMENT A

VERIFIED BY JSG
COMPOUNDS DETECTED 0

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6E FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

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RECEIVED: 08/16/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-167

SAMPLE ID 6F

FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE A
CONC. FACTOR
DATE INJECTED 08/23/84
ANALYST MCL
INSTRUMENT A
VERIFIED BY JSG
COMPOUNDS DETECTED 0

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 6F FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

Analytical Serv REPORT LAB # 84-08-167

RECEIVED: 08/16/84

Results by Sample

SAMPLE ID 7C, 8/14 FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE A DATE INJECTED 08/23/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT A COMPOUNDS DETECTED 0

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 7C, 8/14 FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

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RECEIVED: 08/16/84

Analytical Serv REPORT
Results by Sample

LAB # 84-08-167

SAMPLE ID 7A

FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

DATA FILE A
CONC. FACTOR

DATE INJECTED 08/23/84

ANALYST MCL
INSTRUMENT A

VERIFIED BY JSG
COMPOUNDS DETECTED 5

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND	5	Trichloroethene	0.5
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
1	Trichlorofluoromethane	0.2		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
2	1,1-Dichloroethane	0.6		Tetrachloroethylene #	ND
3	trans-1,2-Dichloroethene	0.4		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
4	1,2-Dichloroethane	0.2		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

Analytical Serv REPORT
LAB # 84-08-167

RECEIVED: 08/16/84
Results by Sample
Continued From Above

SAMPLE ID 7A
FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

CORPORATION

Analytical Serv REPORT LAB # 84-08-167

RECEIVED: 08/16/84 Results by Sample

SAMPLE ID 7C, 8/15 FRACTION 05A TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified Category

DATA FILE A DATE INJECTED 08/23/84 ANALYST MCL VERIFIED BY JSG

CONC. FACTOR INSTRUMENT A COMPOUNDS DETECTED 0

SCAN	COMPOUND	RESULT	SCAN	COMPOUND	RESULT
	Chloromethane	ND		Trichloroethene	ND
	Bromomethane	ND		Dibromochloromethane *	ND
	Vinyl Chloride	ND		1,1,2-Trichloroethane *	ND
	Chloroethane	ND		cis-1,3-Dichloropropene *	ND
	Methylene Chloride	ND		2-Chloroethylvinyl Ether	ND
	Trichlorofluoromethane	ND		Bromoform	ND
	1,1-Dichloroethene	ND		1,1,2,2-Tetrachloroethane #	ND
	1,1-Dichloroethane	ND		Tetrachloroethylene #	ND
	trans-1,2-Dichloroethene	ND		Chlorobenzene	ND
	Chloroform	ND		1,3-Dichlorobenzene	ND
	1,2-Dichloroethane	ND		1,2-Dichlorobenzene	ND
	1,1,1-Trichloroethane	ND		1,4-Dichlorobenzene	ND
	Carbon Tetrachloride	ND			
	Bromodichloromethane	ND			
	1,2-Dichloropropane	ND			
	trans-1,3-Dichloropropene	ND			

SAMPLE ID 7C, 8/15 FRACTION 05A TEST CODE GC 601 NAME EPA Method 601/GC
Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.
All results reported in ug/L unless otherwise specified.
ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).
*Dibromochloromethane, 1,1,2-trichloroethane and cis-1,3-dichloropropene co-elute.
#1,1,2,2-tetrachloroethane and tetrachloroethylene co-elute.

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01B : DUP601
02B : DUP601
03B : DUP601
04B : DUP601
05B : DUP601

RADIAN CORPORATION

APPENDIX I

Correspondence with Federal, State and/or Local Regulatory Authorities

[not used]

APPENDIX J

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9. Nacht, S.J., 1983, "Monitoring Sampling Protocol Considerations," Ground Water Monitoring Review, vol. 3, no. 3., pp. 23-29.

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APPENDIX K

Biographies of Key Personnel

Thomas W. Grimshaw - Program Manager
William M. Little - Project Director
Lawrence N. French - Supervising Geologist
Robert C. Wallace - Pit and Tank Surveying
David H. Gancarz - Sediment Sampling
Nancy P. Stein - Monitor Well sampling
Jill P. Rossi - Cartographer
Ann E. S.Clair - Technical Review

RADIAN
CORPORATION

THOMAS W. GRIMSHAW

EDUCATION:

Ph.D., Geology, University of Texas at Austin, 1976.

M.S., Geology, University of Texas at Austin, 1970.

B.S., Geological Engineering, South Dakota School of Mines and Technology, 1967.

EXPERIENCE:

Division Manager, Policy and Environmental Analysis Division, Radian Corporation, Austin, TX, 1982-Present.

Department Head, Environmental Analysis Department, Radian Corporation, 1978-1982.

Group Leader, Radian Corporation, 1976-1978.

Teaching Assistant, The University of Texas at Austin, 1974.

Captain (R&D Coordinator), U.S. Army, 1970-1972.

Geologist, Junior Grade, Amoco Production Company, 1969-1970.

Geologic Field Assistant, Amoco Production Company, 1967.

Certification: AIPG Certified Professional Geologist No. 4425

FIELDS OF EXPERIENCE:

Dr. Grimshaw has served in a technical and management role in numerous programs at Radian. Most recently, he has been the Technical Coordinator for several survey programs for Environmental Impairment Liability insurance applications. He has also performed or participated in several surveys, including a hazardous waste disposal site, large wastewater treatment plants, pulp and paper mills, aluminum forging and extrusion plants, and a large sanitary landfill.

Dr. Grimshaw is currently acting as Program Manager for two programs for site investigation and remedial action planning for solid/hazardous waste disposal and related activities at installations of the U.S. Air Force. These programs are being conducted at bases in Texas and Louisiana as part of the Air Force's Installation Restoration Program.

In recent months, Dr. Grimshaw has been the Technical Coordinator for a large program being conducted by a major paper company to develop Closure Plans for

impoundments at wood treatment plants in three states. This program included a full complement of studies to define the existing situation and prepare a plan of remedial action for each plant. The initial activity was the sampling and analysis of pond supernatant and sludge, subsoil, and ground water. Bench-scale stabilization studies were performed on the sludge using a number of candidate commercial stabilizing compounds. Several closure alternatives were developed and screened, and a set of alternatives was selected for inclusion in conceptual plans. After the conceptual plans were approved by the client and the regulatory agency, a detailed design was prepared and specifications developed.

For Tuloma Energies, Inc., Radian performed a program directed by Dr. Grimshaw for development of a commercial Hazardous Waste Management Facility in northeastern Oklahoma. During the initial phases of this project, a market analysis was performed to determine the sources at waste that could potentially use the new facility. Subsequently, a regional screening analysis was performed to identify areas most likely to have suitable sites for the new facility. This analysis included screening for several factors, including hydrologic, geologic, topographic, ecologic, and aerometric characteristics as well as population density. Dr. Grimshaw assisted Tuloma Energies in coordinating with the state regulatory agency (Oklahoma Department of Health) during the initial phases of the project. The project is currently being held in abeyance pending improvement in the national economy.

Dr. Grimshaw was Project Director for two programs for a major paper company to evaluate the potential risk of proposed solid waste management plans for paper mills in Arkansas and Mississippi. These programs included collection of waste, soil, and ground-water samples, analysis of the wastes, and batch extraction of the wastes followed by analysis of the leachates. In addition, leachates were generated and attenuated in waste and soil columns to evaluate the capacity of the subsoil to attenuate any leachate that might escape from the disposal site. A ground-water flow model was used to assess the rate and direction of contaminant movement if contaminants were to reach the water table.

Dr. Grimshaw was Technical Director for a generic environmental assessment of wastes from fluidized bed combustion for the U.S. Environmental Protection Agency (EPA). Emphasis was placed on potential hydrologic impacts. Both laboratory studies and field lysimeter tests were conducted in the study. The objectives were to identify and investigate key variables which determine the acceptability of FBC waste disposal and to establish a reliable empirical correlation between laboratory and field results so that better conclusions on field effects can be drawn on the basis of laboratory studies. Provisions of the Resource Convervation and Recovery Act are allowed for in the investigation. Since the regulatory situation for FBC wastes was unclear during conduct of the program, provisions were made for both the eventuality that leachate migration will be allowed in the substrate below the landfill and that leachate escape will be controlled by liners. Interactions between

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leachate and representative disposal media and between leachate and several candidate liner materials were investigated in laboratory studies.

Dr. Grimshaw was also Technical Director for a program to investigate the ground-water impact of a spill of a coal-distillate liquid fuel at an SRC-II (Solvent Refined Coal) pilot plant at Fort Lewis Military Reservation near Tacoma, Pierce County, Washington. The spill site was underlain by highly permeable soils with a water table aquifer at a depth of approximately 30 feet. The study involved detailed coring to establish the location and extent of unsaturated zone cotamination and designing and constructing a set of ground-water monitoring wells to define the extent of ground-water contamination that had occurred. Analytical chemistry support was provided for Resource Conservation and Recovery Act (RCRA) Extraction Procedure testing of contaminated soils and for ground-water quality evaluation. A Remedial Measures Plan was formulated and implemented to remove contaminated material and to prevent the further spread of ground-water contamination. Measures included partial excavation of contaminated soils and installation of production wells for ground-water flow control. This program involved extensive coordination and interfacing with the states regulatory authority (Washington Department of Ecology).

In a follow-up program for which Dr. Grimshaw was again Technical Director, Radian evaluated the overall hydrogeologic impact of the entire SRC plant in addition to the spill area. This program again involved soil sampling, extraction, and analysis as well as water quality monitor well installation and sampling. A zone of contamination was identified, and a comprehensive Remedial Measures Plan was prepared to address the problem.

In a program for Utah International, Incorporated, Dr. Grimshaw was responsible for evaluating the implications of RCRA on the company's mining operations under various regulatory scenarios. Special reference was made to UI's proposed Springer Mine which is in Pershing County, Nevada. Several issues concerning the application of RCRA regulations to metal mines emerged, including the following: (1) applicability of the procedure for classifying solid waste as hazardous or non-hazardous; (2) problems associated with applying disposal regulations to all operations; (3) difficulties in applying limited interim regulations pending development of final regulations; (4) integration of RCRA regulations with other regulations, especially the Clean Water Act; and (5) the appropriateness of certain specific provisions of the regulations such as flood plain definition, financial requirements, and monitoring requirements.

Dr. Grimshaw was Technical Director for the first phase of a project to investigate the environmental feasibility of disposing of flue gas desulfurization (FGD) wastes, ash and sludge, from a mine mouth power plant by backfilling into the associated surface mine in northwestern Colorado. He also had major supervisory and hydrogeologic interpretation roles in the second phase of the program, which included extensive field studies. These field studies included infiltration tests of the mine floor and overburden, water balance

investigations to estimate ground-water recharge, and emplacement of piezometers to ascertain the direction of ground-water flow. A major output of this program was a rating of the various parts of the large surface mine in terms of suitability for ash and sludge disposal.

Dr. Grimshaw was a Task Leader in a program for the EPA ground-water laboratory (Robert S. Kerr Environmental Research Laboratory) to investigate a technique for identifying sources of nitrate ions in ground waters and soils using stable nitrogen isotopes. The usefulness of nitrogen isotope ratios for differentiating sources of nitrate pollution (septic tanks, feedlots, barnyards, and lands receiving municipal waste waters) was evaluated. Soil samples were obtained both by surface augering and by deep boring and coring, and ground-water samples were collected from existing shallow wells. A total of 66 soil samples and contaminated ground waters were analyzed for nitrate, chloride, and for nitrate-nitrogen isotopic composition. Standard statistical techniques were used to analyze the observed variations in $\delta^{15}N$ values, with respect to several nitrate-ion sources and various environmental factors.

For a comprehensive environmental assessment for a proposed large lignite mine in Texas, Dr. Grimshaw prepared and conducted an aquifer test program. These efforts included design of the pump wells and piezometers, layout of the well configuration in the field, oversight of well drilling operations, conduct of the two pump tests, and interpretation of the results in terms of the basic aquifer parameters. In another program related to this mine, Dr. Grimshaw was responsible for evaluating the potential effects on ground water resulting from disposal of ash and FGD solids from a power plant by emplacement of the wastes in the mine.

Prior to his employment by Radian Corporation, Dr. Grimshaw was employed as an oil and gas exploration geologist by Amoco Production Company, Denver, Colorado. Initially, he was a geologic field assistant near the coast of the Gulf of Alaska. This work entailed measuring, describing, and collecting stratigraphic sections in the Tertiary rocks in the vicinity of Cordova and Cape Yakataga, Alaska. Subsequently, Dr. Grimshaw was involved in a gas and petroleum exploration program in northcentral Montana. Most of the effort was in working out the stratigraphy and structural geology in the area of investigation, and he served for a time as well-site geologist on gas exploration wells. In addition, he launched a program of regional exploration in a much larger area in Montana. This work included study of down-hole geophysical logs, preparation of structural contour maps, and assembly of isopachous maps.

HONORARY AND PROFESSIONAL SOCIETIES:

Sigma Xi, Phi Kappa Phi, Sigma Tau, Sigma Gamma Epsilon, Geological Society of America, American Association of Petroleum Geologists, Association of Engineering Geologists.

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PUBLICATIONS/REPORTS:

Grimshaw, T.W. and W.M. Little, "Remedial Measures Plan for a Spill of Solvent Refined Coal Liquid at the SRC Pilot Plant, Ft. Lewis, Washington," Radian Corporation, Austin, TX, August 1980.

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French, L.N., J.C. Lacy, and T.W. Grimshaw, "Regulation of the Hydrologic Impacts of In-Situ Fossil Fuel Recovery," Radian Corporation, Austin, TX, April 1980.

Grimshaw, T.W., et al., "Hydrology-Related Regulatory Risk for a Proposed Lignite Mine in East Texas," Radian Corporation, Austin, TX, December 1979.

Wolterink, T.J., H.J. Williamson, T.W. Grimshaw, and W.F. Holland, "Identifying Sources of Subsurface Nitrate Pollution with Stable Nitrogen Isotopes," Radian Corporation, Austin, TX, August, 1979.

Grimshaw, T.W., et al., "Environmental Impact Statement for the San Antonio, Texas, Wastewater Treatment System," Radian Corporation, Austin, TX, August 1979.

Radian Corporation and Oklahoma University Staff, "Energy from the West: Impact Analysis Report Volume II, Site-Specific and Regional Impact Analyses," Radian Corporation, Austin, TX, March 1979.

Grimshaw, T.W., et al., "Implications of the Resource Conservation and Recovery Act for the Metals Mining Industry: A Case Study of the Springer Project," Radian Corporation, Austin, TX, March 1979.

Grimshaw, T.W., et al., "Preliminary Evaluation of the Hydrologic Impacts of Utilizing the Trapper Mine for Disposal of Wastes from the Craig Station Power Plant, Moffat County, Colorado," Radian Corporation, Austin, TX, October 1980.

James, S.N., T.W. Grimshaw, and J.L. Machin, "Evaluation of Factors Affecting the Acceptability of the Proposed Site for the Erie Mining Company Industrial Fuel Gas Demonstration Plant," Radian Corporation, Austin, TX, August 1978.

Menzies, W.R., et al, "Coal and Lignite Resources for a Medium-Btu Gasification Plant in Texas," Radian Corporation, Austin, TX, May 1978.

Grimshaw, T.W., et al., "Environmental Assessment for the Planned Texas Power and Light Company Sandow Generating Station Unit Number Four, Milam County, Texas," Radian Corporation, Austin, TX, May 1978.

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Holland, W.F., et al., "Environmental Inventory and Assessment for the Proposed Yegua Mine, Milam County, Texas," Radian Corporation, Austin, TX, December 1977.

Grimshaw, T.W., J.L. Machin, and L. Michel, "An Evaluation of Factors Affecting Acceptability of the Proposed Site for the Conoco Coal Development Coal Company Coal Conversion Facility, Noble County, Ohio," Radian Corporation, Austin, TX, November 1977.

Machin, J.L. and T.W. Grimshaw, "Investigation of Water Quality Impacts Related to Development of the Horsepan Creek Basin, Guilford County, North Carolina," Radian Corporation, Austin, TX, October 1977.

Grimshaw, T.W., et al., "Preliminary Environmental Assessment for a Proposed Lignite Surface Mine near Athens, Texas," Radian Corporation, Austin, TX, October 1977.

Holland, W.F., et al., "Environmental Impact Statement for the Greensboro, Guilford County, North Carolina, 201 Wastewater Treatment System (Draft and Final EIS)," Radian Corporation, Austin, TX, September 1977.

RADIAN CORPORATION

WILLIAM M. LITTLE

EDUCATION:

M.S., Civil Engineering, University of California, Berkeley, 1974.

M.S., Hydrology, University of Arizona, Tucson, 1968.

B.S., Hydrology, University of Arizona, Tucson, 1967.

EXPERIENCE:

Senior Engineer and Group Leader, Radian Corporation, Austin, TX, 1982-Present.

Senior Engineer, Radian Corporation, Austin, TX, 1978-1982.

Hydrologist, U.S. Army Environmental Hygiene Agency, 1973-1978.

Research and Technical Operations Officer, U.S. Army Engineer Nuclear Cratering Group, 1969-1971.

Graduate Student in Research, University of Arizona, Tucson, 1968.

FIELDS OF EXPERIENCE:

Mr. Little is a Senior Engineer and Group Leader with a major technical specialty in ground-water pollution studies. He is currently the Project Director for hydrogeologic investigations of multiple waste disposal sites on Kelly Air Force Base, Texas, and Tinker Air Force Base, Oklahoma. These investigations include monitoring well construction, ground-water sampling, and contaminant transport assessment. He is responsible for program design and execution, subcontractor selection, and managing and editing the final report. He has recently completed a hydrogeologic investigation of a Superfund site in western New York state. The project included monitoring well construction, definition of ground-water flow system, assessment of contaminant transport potential, and presentations to regulatory authorities. Mr. Little served as Project Director and principal investigator.

He has served as Project Director and field manager for a large, multidisciplinary characterization of an abandoned hazardous waste disposal site in southern California. The waste materials consist of acid petroleum refinery sludges. Major areas of investigation were: chemical characterization of wastes and geologic materials; quantification of sulfur dioxide and hydrocarbon emissions; and ground-water monitoring. Mr. Little was responsible for managing the field operations and supervising report preparation.

Mr. Little has served as assistant Project Director and field manager for an investigation of the ground-water quality impact of a spill of a coal-distillate liquid at an SRC pilot plant near Tacoma, Washington. The study involved

detailed unsaturated zone coring and designing and constructing a series of ground-water monitoring wells A Remedial Measures Plan was formulated and adopted to remove contaminated materials and to prevent the further spread of ground-water contamination. Following the evaluation of the spill event, Mr. Little directed an expanded program to evaluate the ground-water quality effects of overall plant operations. The possible sources of contamination were identified and characterized. Mr. Little then developed a ground-water monitoring program and supervised the installation of the monitoring network. He designed and conducted aquifer pump tests to define aquifer performance and interpreted the results.

Mr. Little has also conducted a program to evaluate the extent of ground-water contamination by refinery operations and wastes at an oil refinery near Duncan, Oklahoma. The initial assessment was based on site reconnaissance, interviews with refinery personnel and a study of existing hydrogeologic and process data.

Mr. Little has recently completed two environmental/regulatory fatal flaw studies for lignite mines and associated power plants in East Texas. He was both Project Director, responsible for overall management and preparation of the final report, and hydrology task leader, responsible for assembling data on hydrologic conditions and assessing probable impacts. He has also recently served as task leader for regulations review, impact analysis and permit application preparation for a commercial-scale coal gasification facility in Wyoming and ground-water hydrology task leader for environmental analysis of a major lignite mine and associated synfuels plant in east Texas.

In another program, Mr. Little directed an evaluation of surface-water and ground-water availability in the vicinity of the proposed Solvent Refined Coal-II (SRC-II) demonstration plant and commercial facilities near Morgantown, West Virginia.

For a private industrial client, Mr. Little reviewed and evaluated the environmental monitoring data from the vicinity of an in situ coal gasification test in the Powder River Basin of Wyoming. The water quality impacts of the test burn were assessed, and a program of aquifer restoration and hydrologic testing recommended. Based on available hydrologic and geochemical data, a conceptual model of the test site was developed. He also developed a ground-water monitoring and contingency aquifer restoration program for a proposed future test. The program includes selection of well locations and parameters for monitoring and specification of restoration strategies.

Mr. Little has also participated in an assessment of the environmental behavior of fluidized bed combustion (FBC) waste for EPA, IERL. Mr. Little was responsible for the design, construction and operation of field cells for testing FBC waste disposal alternatives and for the development of a preliminary waste transport model. He has also been project director and hydrology

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task leader in the evaluation of the environmental suitability of an ash/scrubber sludge disposal site. He was responsible for the overall management of the program, evaluated the laboratory and hydrogeologic data and predicted contaminant migration.

As a hydrologist with the Water Quality Engineering Division, U.S. Army Environmental Hygiene Agency, Mr. Little served as a consultant to the Office of the Surgeon General and to major commands and installations on hydrologic aspects of water supply and wastewater disposal. He prepared design criteria for programs of effluent and receiving water monitoring at Army manufacturing and research facilities, evaluated ground-water pollution potential of waste disposal practices, and reviewed draft NPDES discharge permits issued to Army installations. He performed preliminary technical feasibility studies of land treatment of wastewater including field investigations and trial systems design. He conducted environmental impact statement data requirements review and prepared and reviewed portions of environmental impact statements. Mr. Little also managed the Army Medical Department's nationwide Drinking Water Surveillance Program.

With the Corps of Engineers, Mr. Little was assigned as a Research and Technical Operations Officer, U.S. Army Engineer Nuclear Cratering Group. There he conducted a general investigation of hydrologic transport of radionuclides from Plowshare application sites. This work included literature searches, computer simulation, experimental design and conceptual modeling of transport phenomena. He also participated in final preparation of a 1971 Corps of Engineers report on Wastewater Management in the San Francisco Bay Region.

While at the University of Arizona, Mr. Little was a member of the Operations Research Study Group on the Tucson Basin, gathering background hydrologic material, and conducting a literature and data file search. He directed and participated in preliminary adaptation of a two-dimensional, finite difference model of a large, heterogeneous ground-water basin.

HONORARY AND PROFESSIONAL SOCIETIES:

American Geophysical Union, American Water Resources Association, National Water Well Association, Sigma Xi.

CERTIFICATION:

AIPG Certified Professional Geological Scientist No. 6468.

PUBLICATIONS/REPORTS:

Numerous technical reports in the fields of water resources development, ground-water contaminant migration, occurrence of radionuclides in ground water, land treatment feasibility and receiving water monitoring, including:

William M. Little

Little, W.M., "Hydrogeologic Investigations, Facet Enterprises, Inc., Elmira, New York," Radian Corporation Final Report to Facet Enterprises, Inc., September 1983.

Little, W.M., et al., "McColl Site Investigation - Phase 1," Radian Corporation Report to the Participants Committee, November 1982.

Little, W.M., et al., "Environmental Considerations and Air Quality Modeling for the Freestone County Project," Radian Corporation Report to Tenneco Coal Company, March 1982.

Grimshaw, T.W., et al., "Assessment of Fluidized-Bed Combustion Solid Wastes for Land Disposal," Draft Final Report, Radian Corporation Report to EPA Industrial Environmental Research Laboratory, December 1982.

Little, W.M., et al., "Environmental Considerations and Air Quality Modeling for the Edgewood and Mustang Creek Prospects and Associated Energy Park," Radian Corporation Report to Tenneco Coal Company, November 1981.

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Little, W.M. and H.J. Williamson, "Recommended Ground-Water Monitoring and Aquifer Restoration Programs, Future In-Situ Coal Gasification Test," Radian Corporation Report to confidential industrial client, September 1980.

Little, W.M. and W.C. Micheletti, "Recommended Aquifer Restoration and Hydrologic Testing Program for an In-Situ Coal Gasification Test," Radian Corporation Report to confidential industrial client, August 1980.

Grimshaw, T.W. and W.M. Little, "Remedial Measures Plan for a Spill of Solvent Refined Coal Liquid at the SRC Pilot Plant, Fort Lewis, Washington," Radian Corporation Report to Gulf Mineral Resources Company, August 1980.

Little, W.M., et al., "Hydrologic Evaluation of a Combined Ash/FGD Sludge Storage Site, Craig Station," Radian Corporation Report to Colorado Ute Electric Association, July 1980.

Little, W.M., T.J. Wolterink, and M.H. McCloskey, "Water Availability Appraisal for the Proposed Solvent Refined Coal-II Demonstration Plant, Monongalia County, West Virginia," Radian Corporation Report to U.S. Department of Energy, February 1980.

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William M. Little

Little, W.M., "Water Quality Geohydrologic Consultation No. 24-0286-77," Twin Cities Army Ammunition Plant, New Brighton, MN, 21-23 July 1976, U.S. Army Environmental Hygiene Agency, 11 January 1977 (six additional geohydrologic consultations; sole author on two, senior on three, junior on one).

Little, W.M., Drinking Water Consultation Visit No. 24-1301-77, Joliet Army Ammunition Plant, Illinois, 2-4 August 1976, USAEHA, 9 February 1977 (four additional drinking water consultations).

Little, W.M., Water Quality Geohydrologic Consultation No. 24-058-75/76, Land Disposal Feasibility Study, Fort Polk, Louisiana, 2-29 April and 9-29 October 1975, USAEHA, 19 August 1976.

Little, W.M., Water Quality Geohydrologic Consultation No. 24-005-76, Land Disposal Feasibility Study, Fort Dix, New Jersey, 21-30 July and 15-23 September 1975, USAEHA, 18 June 1976 (two additional land treatment evaluations as part of water quality engineering special studies).

Little, W.M., Water Quality Monitoring Consultation No. 24-048-74/75, Aberdeen Proving Ground, Maryland, 25-27 February 1974, USAEHA, 17 December 1974 (three additional monitoring consultations).

Little, W.M., Water Quality Engineering Special Study No. 24-017-74, Mixing in Receiving Waters, 7 September-24 October 1973, USAEHA, 3 January 1974.

Little, W.M., Analysis of Hydrologic Transport of Tritium, U.S. Army Engineer Nuclear Cratering Group Technical Memorandum 70-7, Lawrence Radiation Laboratory, Livermore, CA, April 1971.

Little, W.M., An Engineering and Economic Feasibility Study for Diversion of Central Arizona Project Waters from Alternate Sites, M.S. Thesis, Department of Hydrology, University of Arizona, Tucson, AZ, 1968.

RADIAN
CORPORATION

LAWRENCE N. FRENCH

EDUCATION:

M.A., Geological Sciences, University of Texas at Austin, 1979.

B.S., Geological Sciences, University of California at Riverside, 1975.

EXPERIENCE:

Group Leader, Radian Corporation, Austin, TX, 1982-Present.

Staff Geologist, Radian Corporation, Austin, TX, 1979-Present.

Geologist, Sargent and Lundy Engineers, Chicago, IL, 1978-1979.

Teaching Assistant, University of Texas at Austin, 1975-1976.

FIELDS OF EXPERIENCE:

At Radian, Mr. French is involved in a variety of hydrogeologic and geologic studies. His roles in these studies range from collecting and analyzing hydrogeologic data, interpreting and reporting results of investigations, to directing interdisciplinary programs.

Mr. French has been involved in various aspects of ground-water investigations at several hazardous waste disposal sites. He recently served as Project Director for a study of PCB-contaminated soils at an industrial site in North Texas. The study involved sampling and analysis of near-surface soils to define the extent of PCB contamination. Remedial measures options were also identified. Mr. French also developed a ground-water monitoring plan in accordance with the Compliance Agreement between the state and the property owner. As Ground-Water Task Leader, he supervised the installation of monitoring wells at an abandoned petroleum products waste dump in Southern California. This effort involved collection and logging of soil samples and collection of water samples for chemical analysis. He later co-authored a technical report on the occurrence and character of ground water at the site. As Radian's involvement in the investigation continued, Mr. French prepared technical designs and specifications for a permanent, post-remedial action ground-water monitoring network. Mr. French has also been responsible for field activities related to the USAF Installation Restoration Program at Tinker AFB, Oklahoma. At Tinker, electromagnetics surveys were performed at closed industrial waste impoundments and monitoring wells were installed near landfills. At England AFB, Louisiana, Mr. French developed a work plan for the evaluation of waste disposal practices at the base.

As part of a comprehensive hydrogeologic evaluation of a solvent refined coal pilot plant in Washington, Mr. French supervised the installation of water quality monitoring wells and conducted pumping tests for the evaluation of

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aquifer characteristics. He also supervised soil coring and sampling efforts at the site of process fluid spill. Mr. French also served as Project Director for a pre-closure evaluation of two hazardous waste impoundments at a wood treatment plant in Washington. The plant had discharged wastewater containing creosote and pentachlorophenol to the unlined impoundments, which are located on floodplain sands and gravels of the Columbia River. A second site was also examined in terms of disposal practices and the character and volume of wastes. Results of the pre-closure survey were used for a definition of areas of concern requiring closure and for the selection of ground-water monitoring parameters based on the character and volume of wastes.

Mr. French has participated in several ground-water studies for Western coal mining programs. For a large surface mine in New Mexico, he was a principal author of the cumulative hydrologic impact assessment conducted for the Office of Surface Mining. Principal hydrologic concerns for individual mines were identified and compared to predicted hydrologic impacts in order to determine if material damage would result from mining. For a proposed commercial underground coal gasification project, Mr. French was involved in the conceptual design of an aquifer restoration program. Ground water would be withdrawn from the burn cavity, treated at the surface, and reinjected into the coal seam. As Task Leader for both geology and ground-water hydrology tasks for a feasibility study of a proposed lignite gasification facility, Mr. French investigated waste disposal and ground-water supply issues. In addition, Mr. French examined the feasibility of a deep well injection system for the disposal of process wastewaters. This initial evaluation included the identification and characterization of possible injection zones, formation water chemistry, probable injection rates and pressures, and subsurface migration of waste fluids.

As a Project Director on a quick-response effort for the Department of Energy, Division of Fossil Fuel Processing, Mr. French evaluated the water availability for a proposed solvent refined coal demonstration plant in northwestern Kentucky. This project consisted of a comprehensive appraisal of existing and future water supplies, demands, and policies that affect water availability in the vicinity of the demonstration plant.

While employed by Sargent and Lundy Engineers, Mr. French was involved in detailed hydrologic and geologic studies for Preliminary and Final Safety Analysis Reports (PSAR and FSAR) for several nuclear power plants. The PSARs and FSARs involved detailed geologic mapping, inventory of water wells, analysis of subsurface flow, and reviews of regional geologic features. In a study conducted with the Illinois and Indiana Geological Surveys, Mr. French analyzed stratigraphic, structural, and hydrologic features at sites in the Illinois Basin for a compressed air energy storage project. Mr. French directed an extensive hydrogeologic and geologic study of potential sites for a lignite-fired electric generation station in Walker County, Texas. Mr. French also conducted the field program for an engineering soils exploration

effort at a construction site for a lignite-fired power plant in Harrison County, Texas.

Mr. French supervised several field programs at Sargent and Lundy. These programs included: construction and testing of two industrial water wells near Cincinnati; installation and testing of pneumatic piezometers at a nuclear power plant excavation in northern Indiana; and aquifer testing and analysis of hydraulic characteristics of the alluvial-glacial outwash aquifer near Wausau, Wisconsin.

HONORARY AND PROFESSIONAL SOCIETIES:

American Institute of Professional Geologists, CPGS No. 6307; California Registered Geologist No. 3804; Ground-Water Technology Division of the National Water Well Association; Geological Society of America.

PUBLICATIONS/REPORTS:

French, L.N. and J.L. Machin, "Cumulative Hydrologic Impact Assessment for McKinley Mine," Radian Corporation, Austin, TX, January 1984.

Little, W.M. and L.N. French, "Hydrogeologic Aspects of the McColl Site, Fullerton, California," Radian Corporation, Austin, TX, November 1982.

French, L.N., "Pre-Closure Evaluation of the Treated Wood Products Facility and Site C, Longview, Washington," Radian Corporation, Austin, TX, May 1983.

Lacy, J.C., L.N. French, and T.W. Grimshaw, "Regulation of the Hydrologic Impacts of Underground Coal Gasification," in Proc. Sixth Underground Coal Conversion Symposium, Shangri-La, OK, pp. V-79 thru V-88, July 1980.

French, L.N., et al., "Environmental Constraint Analysis of the Proposed Coastal Bend Coal Gasification Project," Radian Corporation, Austin, TX, August 1981.

White, D.M. and L.N. French, "Evaluation, Screening, and Prioritization of Candidate Gulf Coast Lignite Resource Blocks," Radian Corporation, Austin, TX, April 1981.

French, L.N. and J.L. Machin, "Water Availability Appraisal for the Proposed Solvent Refined Coal-I Demonstration Plant, Daviess County, Kentucky," Radian Corporation, Austin, TX, December 1979.

U.S. Bureau of Land Management, "Proposed Camp Swift Lignite Leasing (Draft and Final EIS)," Radian Corporation, Austin, TX, September 1980.

Lawrence N. French

French, L.N., "Compilation of Environmental Information for a Proposed Olefins Complex, Brazoria County, Texas," Radian Corporation, Austin, TX, July 1981 (author of Ground-Water Hydrology and Topography and Geology chapters).

Skinner, F.D., L.N. French, and D.E. Pusch, "Regulatory Review and Estimated Costs for a Proposed In-Situ Gasification Facility," Radian Corporation, Austin, TX, April 1982.

RADIAN
CORPORATION

ROBERT C. WALLACE

EDUCATION:

Master of Engineering, Environmental Engineering, (Minor, Coastal and Oceanographic Engineering), University of Florida, Gainesville, FL, 1980.

Graduate Studies in Statistics, Florida State University, Tallahassee, FL, 1977.

B.A., Environmental Science, University of Virginia, Charlottesville, VA, 1971.

EXPERIENCE:

Staff Engineer, Radian Corporation, Austin, TX, 1981-Present.

Environmental Engineer, Radian Corporation, Austin, TX, 1980-1981.

Graduate Research Assistant, Water Resources Research Center, University of Florida, 1977-1980.

Lieutenant, United States Navy, 1971-1976.

FIELDS OF EXPERIENCE:

While at Radian, Mr. Wallace pursues engineering solutions to environmental problems and issues for both private industry and government clients. His experience and training includes both operational management and engineering research and development roles. His primary research interests at Radian include hydrologic investigations, transport processes in natural systems, and evaluation of alternative waste management treatment systems for energy industries.

Mr. Wallace is participating in the preparation of RCRA part B applications for a variety of clients who operate hazardous waste treatment, storage, or disposal facilities. These include two major petroleum refineries, a new hazardous waste incinerator at a major chemical manufacturing facility, and a research and development facility for a new PCB thermal destruction process. Mr. Wallace has been involved in all phases of the requirements for a RCRA permit incuding incinerator and land treatment demonstrations, liner compatibility testing, ground water investigations, and facility management plans.

Mr. Wallace was the project director of a study of wastewater treatment alternatives available to a major Midwest refinery which had been unble to consistently meet its NPDES discharge limitatinos. The study included a survey of the literature and screening of control technologies for

feasibility and cost considerations. A series of alternatives were developed and the impact of these alternatives in terms of cost and effectiveness evaluated.

At Radian, Mr. Wallace has served as the project director for a number of programs related to the feasibility, environmental acceptability, and permitting strategy for major new energy facilities. This work includes: a stormwater management study for a major oil refinery in the midwest, a feasibility study for a proposed coal gasification plant that included separate studies on site selection, environmental assessment, regulatory analysis, and CPM schedule preparation; several programs to provide all permitting support to proposed natural gas-fired cogeneration power plants to be situated adjacent to major energy or chemical facilities; environmental analysis of noise impacts on nearby communities and wildlife from two large energy plants, one in Kentucky and one in North Texas; hydrologic analysis of the impacts of the discharge of lignite mine depressurization waters to four small creeks in Central Texas; a comparative analysis of the environmental impacts of industrial lignite utilization via direct firing versus medium Btu gasification; a technical review of alternative stormwater management/treatment alternatives for the solvent refined coal (SRC) pilot plant in Fort Lewis, Washington. nd

Mr. Wallace is currently involved in the conduct of environmental surveys of private facilities in support of the risk assessment exercise required by the underwriters of Environmental Impairment Liability Insurance. The survey consists of applicant interviews and facility site visits to assess the level of environmental concern and conduct, particularly in the area of waste handling and disposal practices. Facility surveys have included a hazardous waste treatment and disposal site, a multi-facility metal fabrication manufacturing concern, a diversified high technology corporation, a major airline, and a nuclear power plant construction site.

Mr. Wallace evaluated the air and water environmental impacts of alternative remedial actions proposed for the Superfund clean-up of the Lipari landfill in Pittman, New Jersey. At this site a variety of synthetic organic chemicals were leaching into an urban watershed. In order to predict the fate of individual chemicals, Mr. Wallace employed an environmental fate (Fugacity) model to examine the partitioning behavior of the chemicals leaching into the watercourse and lake downstream from the landfill. This analysis demonstrated that although most of the chemicals were volatile, two substances Bis 2(chloroethyl)ether and Bis 2(chloroethoxy)ethane were soluble enough to be found in the stream and lake downstream.

In Fullerton, California, at the McColl Superfund site, Mr. Wallace evaluated the odor impacts of various alternative clean-up options being considered. In this effort, he exercised a calibrated odor prediction model for evaluating removal options involving site disturbance. This model strongly indicated that even small disturbances of the site (by earth-moving equipment) would produce large odor impacts in nearby residential areas.

Robert C. Wallace

As a research assistant at the University of Florida, Mr. Wallace investigated the hydrology of cypress wetlands to assess their potential for use as water management areas for secondary sewage effluent recycling. This long-term study was under the auspices of the Rockefeller Foundation and the RANN Division of the National Science Foundation. His specific research task was to quantify the surface-water budget. This included measurement and analysis of basin geometry; flow rate determination from analysis of level records; and development of a mathematical prediction model for surface outflow.

Mr. Wallace studied under an EPA-funded program to collect from all sources urban rainfall-runoff-quality data for use in modeling and for characterization of urban stormwater runoff. This data base includes records of over a thousand rainstorms from 85 different catchments in urban areas all over North America. In this effort, Mr. Wallace contributed to the design of the data structure and developed the software programs to access, analyze, and display the data. As part of his Master's research project, he examined the relationship between stormwater quality loadings and precipitation characteristics.

While in the Navy, Mr. Wallace was assigned to several service ships of the U.S. Atlantic Fleet that performed a wide range of ocean engineering tasks including diving operations, oil pollution control, ship and aircraft salvage, and search and rescue throughout the Atlantic and Mediterranean.

PUBLICATIONS:

"Statistical Modeling of Water Quality Parameters in Urban Runoff," Master's Project, University of Florida, 1980.

Surface Water in "Cypress Wetlands for Water Management, Recycling, and Conservation," Final Report to National Science Foundation, Center for the Wetlands, University of Florida, 1980.

"Review of Alternative Stormwater Treatment Systems for the Solvent Refined Coal (SRC) Pilot Plant, Fort Lewis, Washington," Technical Memorandum, Radian Corporation, Austin, TX, 1980.

Environmental Noise - in "An Environmental Assessment for a Geothermal Direct Utilization Project in Reno, Nevada," Radian Corporation, Austin, TX, 1980.

Surface Water and Noise - in "Environmental Report: Combustion Engineering/Gulf States Utilities Company Fuel Gas Demonstration Plant, West Lake, Louisiana," Radian Corporation, Austin, TX, September 1981.

"Analysis of the Impacts of Mine Depressurization Discharges from the Milam Mine," Technical Memorandum, Radian Corporation, Austin, TX, March 1982.

Robert C. Wallace

"Preliminary Site Screening Studies: Celanese East Texas Project Final Report, for Task 2 and 3," Radian Corporation, Austin, TX, May 1981.

"Air Quality Siting Constraints in Robertson and Shelby Counties, Texas," Technical Memorandum, Radian Corporation, Austin, TX, July 1981.

"Environmental Screening of Candidate Sites in Brazoria, Robertson, and Shelby Counties," Final Report for Tasks 4 and 5, Radian Corporation, Austin, TX, October 1981.

"Regulatory Compliance Schedule for Environmental Licensing of a Coal Gasification Facility in Texas," Final Report for Task 7, Radian Corporation, Austin, TX, October 1981.

Noise in - "Environmental Information Document for a Proposed Lignite Beneficiation Plant Demonstration Project, Robertson County, Texas," Radian Corporation, Austin, TX, May 1981.

"Problems and Issues Related to Surface-Water Quality Regulation," Report to the Department of Energy, Radian Corporation, Austin, TX, July 1981.

Noise and odor Chapters in - "Compilation of Environmental Information for Tri-State Synfuels Project," Radian Corporation, Austin, TX, September 1981.

"Environmental Assessment of Air Quality, Surface Water, and Noise Impacts for the Proposed Milam Mine," Radian Corporation, Austin, TX, July 1982.

Surface Water Controls in - "Evaluating Cost-Effectiveness of Remedial Actions at Uncontrolled Hazardous Waste Sites," Draft Methodology Manual, Radian Corporation, Austin, TX, January 1983.

Surface Water and Air Quality in - "Draft Environmental Information Document for Remedial Actions at the Lipari Landfill, Pitman, New Jersey," Radian Corporation, Austin, TX, October 1982.

Environmental Fate in - "Development of a Monitoring Program to Evaluate the Effect of Remedial Actions at the Lipari Landfill on Alcyon Lake, Pitman, New Jersey," Radian Corporation, Austin, TX, January 1983.

"Interim Task Report: Noise and Odor, Texas Gasification Project," Techncial Report, Radian Corporation, Austin, TX, January 1983.

Closure, Contingency, and Training Plans in - "Hazardous Waste Incinerator, Industrial Hazardous Waste Part B Permit Application," Radian Corporation, Austin, TX, January 1983.

Robert C. Wallace

"Audible Noise Measurements from an Electric Transmission Line near Weimar, Texas," Technical Note, Radian Corporation, Austin, TX, March 1982.

"Noise Assessment for a Proposed Snack Food Manufacturing Facility in Kern County, California," Radian Corporation, Austin, TX, October 1982.

Surface Water in - "Site Evaluation and Regional Screening Analysis for the Tuloma Waste Management Facility," Radian Corporation, Austin, TX, February 1982.

PRESENTATIONS:

"Gasification vs. Direct Firing of Lignite: An Environmental Comparison," Paper presented at American Water Resources Association Symposium on Water for Energy, Houston, TX, December 1980.

"Permitting of a Hazardous Waste Incineration Facility in Northern California," Presentation to the Peninsula Industrial and Business Association Symposium on Practical Alternatives to the Land Disposal of Hazardous Wastes, Palo Alto, CA, June 1982.

RADIAN
CORPORATION

DAVID H. GANCARZ

EDUCATION:

Master of Engineering, Environmental Engineering (Hydrology), University of Florida, Gainesville, FL, 1984.

Bachelor of Arts, Grinnell College, Grinnell, IA, 1976.

EXPERIENCE:

Engineer, Radian Corporation, Austin, TX, 1984-Present.

Graduate Research Assistant, Department of Environmental Engineering, University of Florida, Gainesville, FL, 1983-1984.

Chemist I, Department of Food Science & Human Nutrition, University of Florida, Gainesville, FL, 1981-1982.

Laboratory Technologist I, Department of Soil Science and Department of Fruit Crops, University of Florida, Gainesville, FL, 1977-1981.

Graduate Teaching Assistant, Department of Botany, University of Florida, Gainesville, FL, 1976-1977.

FIELDS OF EXPERIENCE:

As an Engineer at Radian, Mr. Gancarz has been involved with the final preparation of an atmospheric modeling study for the EPA using STRATOS. Mathematical manipulations of the model output as well as graphical presentation were performed on the IBM PC using Lotus 1-2-3.

As a Graduate Research Assistant, Mr. Gancarz was responsible for researching and writing a thorough literature review of the sources, effects, and regulations concerning ambient air flourides for the Florida Department of Environmental Regulation. A later project under the South West Florida Water Management District involved a study of the surface and subsurface hydrology around a 150 MGD wellfield in central Florida. The focus of the project was a modeling effort using the hydrologic models HSPF and PLASM.

His graduate research was an adaptation of the Storage/Treatment block of the widely used urban stormwater runoff model SWMM to microcomputer. A consequence of this research is proficiency with MS DOS, Apple DOS, Apple PASCAL, CP/M, and the FORTRAN compilers F-80 by Microsoft and IBM PC FORTRAN by Microsoft.

Prior to his return to graduate school, Mr. Gancarz conducted analyses of pesticide residues in soil and tissue samples for the Institute of Food and Agricultural Sciences at the University of Florida. Various phases of this

David H. Gancarz

work involved sample preparation, gas chromatographic analysis, and radioisotope tracer techniques. While at the Department of Fruit Crops at the University of Florida, Mr. Gancarz developed an efficient assay for cellulase isozymes in citrus.

PUBLICATIONS:

Gancarz, D.H. and W.C. Huber, "The USEPA Storm Water Management Model Storage/Treatment Block for the IBM Personal Computer," Paper to be presented at the Storm Water & Water Quality Model Users Group Conference, Hamilton, Ontario, Canada, 1984 (in preparation).

Gancarz, D.H., et al., "Ambient Atmospheric Fluoride Pollution in Florida," Report to State of Florida Department of Environmental Regulation, 1983.

Huber, W.C., D.H. Gancarz, and R.E. Dickinson, "Apple SWMM, a Possibility?" Proceedings of Conference on Emerging Computer Techniques in Stormwater Management, Ontario, Canada, 1983.

Ou, L.T., et al., "Infuence of Soil Temperature and Soil Moisture on Degradation and Metabolism of Carbofuran in Soils," Journal of Environmental Quality, 11:293-298, 1982.

RADIAN
CORPORATION

NANCY PACHARZINA STEIN

EDUCATION:

B.S., Engineering Science/Environmental Engineering, University of Texas at Austin, 1979.

EXPERIENCE:

Environmental Engineer, Radian Corporation, Austin, TX, 1979-Present.

FIELDS OF EXPERIENCE:

As an environmental engineer at Radian, Ms. Stein has performed several wastewater, solid/hazardous waste, and hydrology related studies.

At present, Ms. Stein is working on several projects including an evaluation of treated wastewater from a gasification facility for use as cooling water. As task leader on this project, Ms. Stein coordinated laboratory bench-scale cooling tower tests and was responsible for data reduction and analysis. These data will subsequently be used to verify Radian's predictive cooling tower computer model.

In addition to the cooling tower study, Ms. Stein is also coordinating a project to characterize the Biotechnology Industry in terms of major processes and products and to identify and characterize the waste streams associated with this industry.

Ms. Stein served as Project Director in the conduct of a laboratory biological treatability study of contaminated leachate from a superfund site in New Jersey. Specific issues addressed in this study include: bioaccumulation of contaminants in the waste sludge, release of volatile organics over the aeration basin, and overall treatment performance for the pollutants of concern. As project director for this study, Ms. Stein's role included development of the test plan, monitoring laboratory operations, data reduction and analysis, and overall project management.

For the Environmental Protection Agency, Ms. Stein recently participated on a project to perform a cost-effectiveness evaluation of various remedial action alternatives for a superfund site in New Jersey. Her primary role on this project was to assess various alternatives for treatment of contaminated ground water at the site. Specifically, Ms. Stein identified treatment alternatives, developed the design criteria for each, and provided cost estimates for leachate treatment.

For a related project, Ms. Stein is participating in an effort to prepare a guidance document which can be used by EPA and state regulatory personnel in developing remedial action plans and/or evaluating the factors affecting reliability and cost-effectiveness. Her task on this project is to develop

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remedial action data summaries for biological and in-situ waste treatment technologies. Items to be addressed for each technology include applicability, limitations, performance, reliability, safety considerations, and development of a design basis to derive cost estimates.

For a major industrial client, Ms. Stein participated in a project to evaluate remedial action alternatives for the clean-up of wood processing waste ponds. Specifically, Ms. Stein identified appropriate technologies for treatment of both the sludges and liquid wastes and assessed the expected performance of each. Future work on this project will involve development of plans and specifications for the selected alternative and management of implementation.

For a major synfuels syndicate, Ms. Stein participated in the development of a test plan for a bench-scale biological treatment study of coal gasification process wastewaters. Based on the characterization of the wastewater, Ms. Stein derived the appropriate operational parameters and was responsible for monitoring the reactors through the acclimation phase.

For EPA's Effluent Guidelines Division, Ms. Stein served as Task Leader in the Development of Effluent Limitations Guidelines and Standards for the Aluminum Forming Point Source Category. During the project Ms. Stein interfaced with both EPA and representatives from the industrial s ctor. Major activities on this project included responding to comments on the proposed regulation and planning and conducting plant sampling trips in response to industry comments.

On a major contract for EPA's Office of Solid Waste, Ms. Stein prepared an engineering analysis of High Density Polyethylene (HDPE) production processes. This effort included identifying the major production processes for HDPE, identification and characterization of waste streams from these processes, and development of material balances for each process. The purpose of this analysis was to identify waste streams for potential listing as hazardous waste under RCRA.

For the Laramie Energy Technology Center (LETC), Ms. Stein served as task leader on a project to develop a Hazardous Waste Management Plan (HWMP) and Employee Training Seminar. Her role on this project included critical evaluation of waste handling procedures, development of the HWMP and Training Program, as well as presentation of the training seminar to LETC personel.

On another project for LETC, Ms. Stein participated in a project to inventory and sample potentially hazardous waste at a Department of Energy (DOE) facility. This project involved participating in the actual sampling program, classification of the wastes under RCRA, and development of subsequent disposal alternatives.

Ms. Stein also provided technical assistance to the Environmental Protection Agency (EPA) on the development of Pollution Control Technical Manuals for the synfuels industry. Her role in this project involved characterization of

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process effluents and the evaluation of biological treatment performance. Additionally, Ms. Stein assisted in the development of a performance and cost model of biological treatment for coal gasification wastewaters.

For a major industrial client, Ms. Stein recently performed a study on the characterization of BIOX sludge from gasification wastewater treatment. This project involved wastewater characterization, a quantitative assessment of BIOX performance, and a determination of trace metal concentrations in the BIOX sludge.

Ms. Stein participated in a study of stormwater runoff treatment for a pilot-scale SRC-II plant. Her role on this project consisted of assessing the quality of coal pile and general plant area runoff to be treated.

For a generic study of the environmental residuals and resource requirements associated with gasification of lignite in Texas, Ms. Stein provided technical input in the areas of water resources and wastewater and solid waste residuals. On this project, Ms. Stein was also responsible for management of the project team.

Ms. Stein was responsible for evaluation of surface coal mining wastewater treatability studies in support of an EPA contract to develop effluent guidelines for the Energy and Mining Point Source Category. This project involved a critical evaluation of the methods used during the studies as well as analysis of the data generated.

Ms. Stein has performed numerous surface-water hydrology site assessments for both government and industrial clients. These projects typically involve a complete characterization of baseline conditions and quantitative assessment of potential impacts to surface waters by the proposed action.

RADIAN
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JILL P. ROSSI

EDUCATION:

B.A. Geography, The University of Minnesota at Minneapolis, 1972.

EXPERIENCE:

Geographer, Cartographer, Policy and Environmental Analysis Division, Radian Corporation, Austin, TX, 1980-Present.

Drafting and Graphics Assistant, Dam Safety Unit, Texas Department of Water Resources, Austin, TX, 1979-1980.

Cartographer, Continental Map Inc., Austin, TX, 1978-1979.

Teaching Assistant, University College-Geology, University of Minnesota at Minneapolis, 1972.

FIELDS OF EXPERIENCE:

At Radian, Ms. Rossi is responsible for producing maps and coordinating graphics for the Policy and Environmental Analysis Division. She utilizes data from a variety of technical disciplines (geology, hydrology, noise and air monitoring, sociology, soils, and hydrogeology) to create maps which clearly and concisely illustrate the written text. Ms. Rossi has been responsible for work in the following projects:

- Develop base maps and coordinate graphics throughout an Environmental Impact Statement prepared for the U.S. Bureau of Land Management for a central Texas lignite mine;

- Develop color overlay method of mapping for site selection process of commercial waste disposal sites in Texas and southeastern Oklahoma;

- Develop a series of figures used as illustrations in a manual for the Environmental Protection Agency on Remedial Actions at Uncontrolled Hazardous Waste Sites:

- Draft maps and coordinate the graphics for an Environmental Impact Statement for a synfuels plant in Tennessee;

- Create base and thematic maps for Air Force Installation Restoration Programs (Phase I and Phase II) for the following locations: Kelly AFB, Texas; Hill AFB, Utah; Bergstrom AFB, Texas; Cannon AFB, New Mexico; England AFB, Louisiana; Tinker AFB, Oklahoma; and Reese AFB, Texas;

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- o Map limestone deposits, lime plants, and limestone quarries in the United States by county in a series of regional maps for the Electric Power Research Institute;
- o Map compliance/non-compliance with air pollution standards for counties in the United States in a series of EPA regional maps;
- o Map concentrations of selected air pollutants in the El Paso, Texas, area for a Texas Air Control Board study in a series of quarterly and annual reports;
- o Prepare aerial photography history of a wood preserving plant for a commercial client which included extensive research of available aerial photography and interpretation of those photos to determine historical features of interest;
- o Prepare complex permitting schedules for proposed mines, energy facilities, and hazardous waste handling sites;
- o Preparation of base and thematic maps for various feasibility studies, fatal flaw analyses, Environmental Information Documents, and Environmental Impact Statements; and
- o Research of available map resources, aerial photography, remote sensing products, and mapping technologies as required by individual client needs.

While with the Texas Department of Water Resources, Ms. Rossi worked in the graphics section of the Dam Safety Unit, a federal grant program. She prepared maps and exhibits, and laid out phototypset text into camera-ready form according to standards, developed with her assistance, for the technical reports written by the engineering section.

During her employment with Continental Map Incorporated, Ms. Rossi was involved in all phases of four color map production. These included source information procurement and classification, imaging base maps, scribing plates, cutting specialties, sizing and adhering type, designing customer copy panels, indexing streets and points of interest, photo-lab contact reproduction of base plates, and the final compositing of the four negative plates to be sent to the printer. These maps included large metroplex areas, counties, enlarged downtown sections, and simplified principle city thoroughfares.

While employed by the University of Minnesota as a Geology Teaching Assistant, Ms. Rossi taught geology laboratory sessions, prepared geology lab work materials, tutored students, and assisted the professors by preparing classroom presentations and grading and proctoring exams.

ANN E. ST. CLAIR

EDUCATION:

M.A., Geological Sciences, The University of Texas at Austin, 1979.

B.A., Geology, Trinity University, 1973.

EXPERIENCE:

Department Head, Radian Corporation, Austin, TX, 1982-Present.

Group Leader, Radian Corporation, 1979-1982.

Senior Geologist, Radian Corporation, 1980-Present.

Staff Geologist, Radian Corporation, 1978-1980.

Research Scientist Associate, The University of Texas at Austin, Bureau of Economic Geology, 1975-1978.

Research Scientist Assistant, The University of Texas at Austin, Bureau of Economic Geology, 1973-1975.

FIELDS OF EXPERIENCE:

At Radian, Ms. St. Clair has had extensive experience in studies relating to ground-water geology, waste disposal, and environmental impacts. Her work has included acquisition of data on ground water, assessment of water quality impacts, and compilation and interpretation of geologic data including geophysical and core logs, and evaluation of impacts of waste disposal and other activities. In hazardous waste studies her work has also involved evaluation of remedial action alternatives and interface with engineers, chemists and other specialists regarding various aspects of hazardous waste investigations including engineering design and cost of remedial action, control of emissions and odors, and waste characteristics. As Department Head at Radian Ms. St. Clair supervises the work of geologists, hydrologists, and ecologists and has management and technical review responsibility for programs in these technical areas.

Ms. St. Clair was Project Director for the second phase of a continuing study at the McColl hazardous waste site in the Los Angeles area. In this phase, data collected in Radian's Phase 1 field investigation of the site were evaluated and used in the selection and design of the remedial action plan for the site. The site, which is located adjacent to a residential and recreational area, contains various hydrocarbon wastes, principally acidic refinery sludges and drilling muds. Control of volatile emissions, odors, and the potential for contamination of surface water and ground water were addressed in the

remedial action design. The design must meet strict criteria regarding exposure to contaminants both during remedial action implementation and over the long term.

Ms. St. Clair has major responsibility for studies being performed at several uncontrolled hazardous waste sites, including sites identified as priority sites for remedial action under Superfund. She was Project Director for the first phase of a study to evaluate ground-water conditions at a Superfund site in up-state New York which was used for disposal of wastes from a metal plating operation. The study included installation of monitor wells and test borings and collection of soil and ground-water samples in order to define the presence or extent of subsurface contamination. Based on the results of the field investigation, recommendations for further study or remedial action were developed. During the course of this program, Ms. St. Clair has been involved in initial site evaluation and data collection, development of a site field program, and interface with state and federal regulatory agencies.

Ms. St. Clair has had overall technical responsibility for a variety of activities for the EPA Solid and Hazardous Waste Research Division. These studies, generally involving technical support of Superfund activities, have included a field geophysical survey, treatability studies, column absorption/desorption studies, hydrogeologic evaluations, review of feasibility studies, and evaluation of remedial action technologies for approximately ten Superfund sites. Ms. St. Clair's role included project management, technical supervision and review, and agency coordination.

For the Lipari landfill Superfund site near Pitman, New Jersey, Ms. St. Clair was responsible for coordinating a variety of technical activities as support to EPA Region II. The site contains a variety of industrial wastes, of which several volatile organic chemicals known to be extremely hazardous are of primary concern. Leachate seeps enter surface streams adjacent to the site and have resulted in a ban on fishing and boating in a lake 1000 feet downstream. Ms. St. Clair had overall responsibility for coordinating the following activities at this site--cost-effectiveness evaluation of 32 remedial action alternatives, preparation of an Environmental Information Document assessing the environmental impacts of remedial action alternatives, definition of baseline conditions and design of a long-term monitoring program on the lake, and a treatability study of the landfill leachate. For all these activities Ms. St. Clair was the principal interface with EPA and had primary technical review and management responsibility.

In a study for the EPA Municipal Environmental Research Laboratory, Ms. St. Clair supervised development of a methodology for conducting evaluations of cost-effectiveness of remedial actions at uncontrolled hazardous waste sites. Under the Comprehensive Environmental Response, Compensation and Liability Act (Superfund), remedial actions conducted at Superfund sites must be demonstrated to be cost-effective. The study involved review of technical and cost

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data on remedial technologies, evaluation of methodologies for cost-effectiveness and related types of analyis, assessment of impacts of time and discount rates on the evaluation, and development of the analytical framework and guidance manual to be used by decision makers in selecting remedial measures.

Ms. St. Clair has participated in Radian's activities related to collection of insurance underwriting information for Environmental Impairment Liability (EIL) Insurance. She worked closely with Radian's parent company, Hartford Steam Boiler Inspection and Insurance Company (HSB) in developing procedures for collection of technical and engineering underwriting information and functions in a Quality Assurance role by reviewing results of all Radian investigations of this type. In 1981 Ms. St. Clair was Project Director for a risk assessment of three power plants in the Boston area. The study involved brief site visits and review of corporate and regulatory agency files in order to assess the potential for gradual environmental impairment as a result of plant activities. The study included assessment of ground-water conditions, waste management practices, hazardousness of materials used on-site, population-at-risk, and corporate approach to environmental matters. A report was prepared containing information for use in underwriting Environmental Impairment (EIL) Insurance.

During 1981, Ms. St. Clair was Project Director for a large program to develop a waste management strategy for the Wyoming Coal Gasification Project. The program involved chemical and physical analysis and regulatory classification of power plant and gasification wastes and organic by-products. Based on the results of the testing, recommendations were made for treatment and disposal of wastes to meet applicable regulatory requirements. In addition, the study included column leaching studies to assess impacts of mine disposal of plant wastes, evaluation of ground water impact of disposal facilities at the plant site, and preparation of applicable state and federal permit applications.

In 1980-1981, Ms. St. Clair was Project Director for a program to evaluate waste disposal practices and ground-water conditions at a large petroleum refinery in Kenai, Alaska. The study focused on development of a long-term waste management strategy for disposal of refinery wastes, principally API separator bottoms and crude tank bottoms, which have been designated as hazardous wastes under RCRA. Initially Ms. St. Clair supervised design, installation and sampling of ground-water monitoring wells in the vicinity of existing disposal sites in order to assess the water-quality impacts of past disposal practices. Samples of all refinery waste streams and wastes from existing pits were characterized for the purpose of developing a plan for closure of existing pits and an ultimate waste management plan. Options were evaluated with respect to technical feasibility (particularly in light of climatic factors), environmental acceptability, regulatory compliance, and economics.

In 1979, Ms. St. Clair was Project Director for an investigation of soil/ground-water contamination and remedial action at a pesticide formulation

facility in north Texas. The study was aimed at evaluating possible contamination from underground waste storage tanks suspected of leaking. Ms. St. Clair initially conducted sampling of soils in the vicinity of the tanks to determine if leakage had occurred. She also designed and supervised installation of a network of ground-water monitoring wells in order to evaluate ground-water flow at the site and to assess water-quality impacts of the suspected leakage. During drilling, core samples were taken in both the unsaturated and saturated zone for chemical analysis. Ms. St. Clair performed slug tests on the wells to provide data on aquifer properties. She also supervised infiltration tests in order to evaluate the surface infiltration conditions and to qualitatively assess the potential for leachate generation. Based upon the results of this study, recommendations were made for further studies and possible remedial actions.

In a study to determine impacts of a product spill at a Solvent Refined Coal-II demonstration plant in Fort Lewis, Washington, Ms. St. Clair was responsible for portions of the ground-water evaluation, including installation of monitoring wells, measurements of water levels, and interpretation of hydrologic and chemical data. She was also involved in interfacing with state regulatory agencies.

Ms. St. Clair was Project Director of a study for EPA Region III, evaluating the suitability of land around the Cheswick Power Station near Pittsburgh, Pennsylvania, for disposal of coal ash and scrubber sludge. The study was conducted as technical support for enforcement actions brought by EPA Region III concerning alleged violations of air emissions regulations from the coal-fired power plant. In the event that installation of SO_2 scrubbers was to be required by EPA, this study was underaken to document the availability of land for disposal of wastes from the scrubbers. During the study, Ms. St. Clair supervised a multidisciplinary team evaluating the hydrogeology, transportation, land use, ecology, and economic factors affecting the acceptability of sites in the vicinity of the plant for disposal of wastes.

In a study for EPA Region VII, Ms. St. Clair supervised several programs concerned with suitability of soils for septic tanks and nitrate contamination of ground water in Missouri. Ms. St. Clair supervised technical efforts on three programs. One program involved detailed soils mapping and field examination of septic tank failures in Greene County, Missouri, and in order to develop a septic-tank suitability map. Another study focused on determination of any relationships between water well construction practices and occurrence of ground water contamination in Howell County, Missouri. It involved a field survey for sampling of ground water and for obtaining information on well construction. A third program was conducted to develop a regional map of nitrate concentrations in ground water in the four-state area of EPA Region VII. In addition to development of technical reports for each of these studies, reports were prepared for lay readers.

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Ms. St. Clair was Project Director for a feasibility and site selection study for an in-situ gasification project utilizing Texas lignite. The study focused on evaluation of environmental factors that might affect project feasibility. Ms. St. Clair was involved in overall project coordination as well as studies related to environmental and hydrologic conditions at several candidate sites.

As a research associate at the Bureau of Economic Geology, Ms. St. Clair was involved in numerous studies requiring collection and interpretation of geologic data, sampling and chemical analysis of ground water, and evaluation of environmental and engineering impacts of man's activities. She was responsible for the preparation of maps, technical reports, and presentations, as a part of these programs.

PROFESSIONAL/TECHNICAL SOCIETIES:

American Institute of Profession Geological Scientists, Certified Professional Geological Scientist 4741; National Water Well Association, Ground Water Technology Division; Geological Society of America; Austin Geological Society.

PUBLICATIONS:

Radian Corporation, "Cost-Effectiveness Evaluation of Remedial Action Alternatives for the McColl Site, Fullerton, California," Final Report, June 1983.

Radian Corporation, "Environmental Assessment of the Remedial Action Alternatives for the McColl Site, Fullerton, California," Final Report, June 1983.

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St. Clair, A.E., M.H. McCloskey, and J.S. Sherman, "Development of a Framework for Evaluating Cost-Effectiveness of Remedial Actions at Uncontrolled Hazardous Waste Sites," Proceedings, Third National Conference on Management at Uncontrolled Hazardous Waste Sites, Washington, DC, December 1982.

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George, F.M., et al., "Assessment of Gulf Coast Lignite Marketability," Final Report, August 1980.

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St. Clair, A.E. and J.L. Parr, "A Preliminary Investigation of Potential Soil/Ground-Water Contamination at a Pesticide Formulation Facility in North Texas," Phase I Final Report, October 1979.

Radian Corporation, "Preliminary Environmental Assessment for a Proposed Olefins Complex, Brazoria County, Texas," August 1979.

Grimshaw, T.W., J.L. Machin, J.R. Mase, A.E. St. Clair, and F.H. Sheffield, "Hydrology Related Regulatory Risks for Lignite Mining at a Prospect in Eastern Texas and Western Louisiana," July 1979.

Garner, L.E., A.E. St. Clair, and T.J. Evans, "Mineral Resources of Texas (map)," Bureau of Economic Geology, University of Texas, Austin, 1979.

St. Clair, A.E., "Mineral Lands in the City of Dallas: Bureau of Economic Geology," University of Texas, Austin, Geological Circular 78-1, 1978.

St. Clair, A.E., T.J. Evans, and L.E. Garner, "Energy Resources of Texas (map)," Bureau of Economic Geology, University of Texas Austin, scale 1:1,000,000, 1976.

Ann E. St. Clair

St. Clair, A.E., C.V. Proctor, W.L. Fisher, C.W. Kreitler, and J.H. McGowen, "Land and Water Resources, Houston-Galveston Area Council," Bureau of Economic Geology, University of Texas, Austin, Land Resources Laboratory Map Series, 25 p., 4 maps, scale 1:125,000, 1975.

APPENDIX L

Geophysical Tracings

RADIAN CORPORATION

DRAFT

Specifications of Ground Conductivity Meters
Utilized for Geophysical Surveys
(from manufacturer's literature, Geonics, Ltd.)

ONE MAN

CONTINUOUS READING

EM31

The Geonics EM31 provides a measurement of terrain conductivity without contacting the ground using a patented inductive electromagnetic technique. The instrument is direct reading in millimhos per meter and surveys are carried out simply by traversing the ground.

The effective depth of exploration is approximately six meters making it ideal for engineering geophysics. By eliminating ground contact, measurements are easily carried out in regions of high resistivity such as gravel, permafrost and bedrock. Over a uniform half space the EM31 reads identically with conventional resistivity and the measurement is analogous to a conventional galvanic resistivity survey with a fixed array spacing. Interpretation curves supplied with each instrument often permit an estimate of a layered earth.

The advantages of the EM31 are the speed with which surveys can be carried out, the ability to precisely measure small changes in conductivity, and the continuous readout which provides a previously unobtainable lateral resolution.

Specifications

MEASURED QUANTITY	Apparent conductivity of the ground in millimhos per meter
PRIMARY FIELD SOURCE	Self-contained dipole transmitter
SENSOR	Self-contained dipole receiver
INTERCOIL SPACING	3.66 meters
OPERATING FREQUENCY	9.8 kHz
POWER SUPPLY	8 disposable alkaline 'C' cells (approx. 20 hrs life continuous use)
CONDUCTIVITY RANGES	3, 10, 30, 100, 300, 1000 mmhos/meter
MEASUREMENT PRECISION	±2% of full scale
MEASUREMENT ACCURACY	±5% at 20 millimhos per meter
NOISE LEVEL	<0.1 millimhos per meter
OPERATOR CONTROLS	●Mode Switch ●Conductivity Range Switch ●Phasing Potentiometer ●Coarse Inphase Compensation ●Fine Inphase Compensation
DIMENSIONS	Boom: 4.0 meters extended; 1.4 meters stored Console: 24 x 20 x 18 cm Shipping Crate: 155 x 42 x 28 cm
WEIGHT	Instrument Weight: 9 kgm Shipping Weight: 23 kgm

TWO MAN

VARIABLE DEPTH

EM34-3

Operating on the same principles as the EM31, the EM34-3 is designed to achieve a substantially increased depth of exploration and a readily available vertical conductivity profile.

The underlying principle of operation of this patented non-contacting method of measuring terrain conductivity is that the depth of penetration is independent of terrain conductivity and is determined solely by the instrument geometry, i.e. the intercoil spacing and coil orientation. The EM34-3 can be used at three fixed spacings of 10, 20, or 40 meters and in the vertical coplanar (as shown) or horizontal coplanar mode. In the vertical coplanar mode, the instrument senses to approx. 0.75 of the intercoil spacing. In the horizontal coplanar mode, the instrument can sense to 1.5 times the intercoil spacing. For the horizontal coplanar mode, however, coil misalignment errors are more serious than in the vertical mode so greater care must be exercised to achieve the maximum 60 meter depth.

Simple operation, survey speed and straight forward data interpretation makes the EM34-3 a versatile and cost effective tool for the engineering geophysicist.

Specifications

MEASURED QUANTITY	Apparent conductivity of the ground in millimhos per meter
PRIMARY FIELD SOURCE	Self contained dipole transmitter
SENSOR	Self contained dipole receiver
REFERENCE CABLE	Lightweight, 2 wire shielded cable
INTERCOIL SPACING & OPERATING FREQUENCY	●10 meters at 6.4 kHz ●20 meters at 1.6 kHz ●40 meters at 0.4 kHz
POWER SUPPLY	Transmitter: 8 disposable 'D' cells Receiver: 8 disposable 'C' cells
CONDUCTIVITY RANGES	3, 10, 30, 100, 300 mmhos/meter
MEASUREMENT PRECISION	±2% of full scale deflection
MEASUREMENT ACCURACY	±5% at 20 millimhos per meter
NOISE LEVEL	<0.2 millimhos per meter
DIMENSIONS	Receiver Console: 19.5 x 13.[illegible] x 28cm Transmitter Console: 15 x 8 x 26cm Coils: 63cm diameter
WEIGHTS	Receiver Console: 3.1 kg Receiver Coil: 3.2 kg Transmitter Console: 3.0 kg Transmitter Coil: 6.0 kg Shipping Weight: 41 kg

SPECIFICATIONS OF MAGNETOMETER UTILIZED FOR GEOPHYSICAL SURVEYS
(From Manufacturer's Literature, EDA Instruments, Inc.)

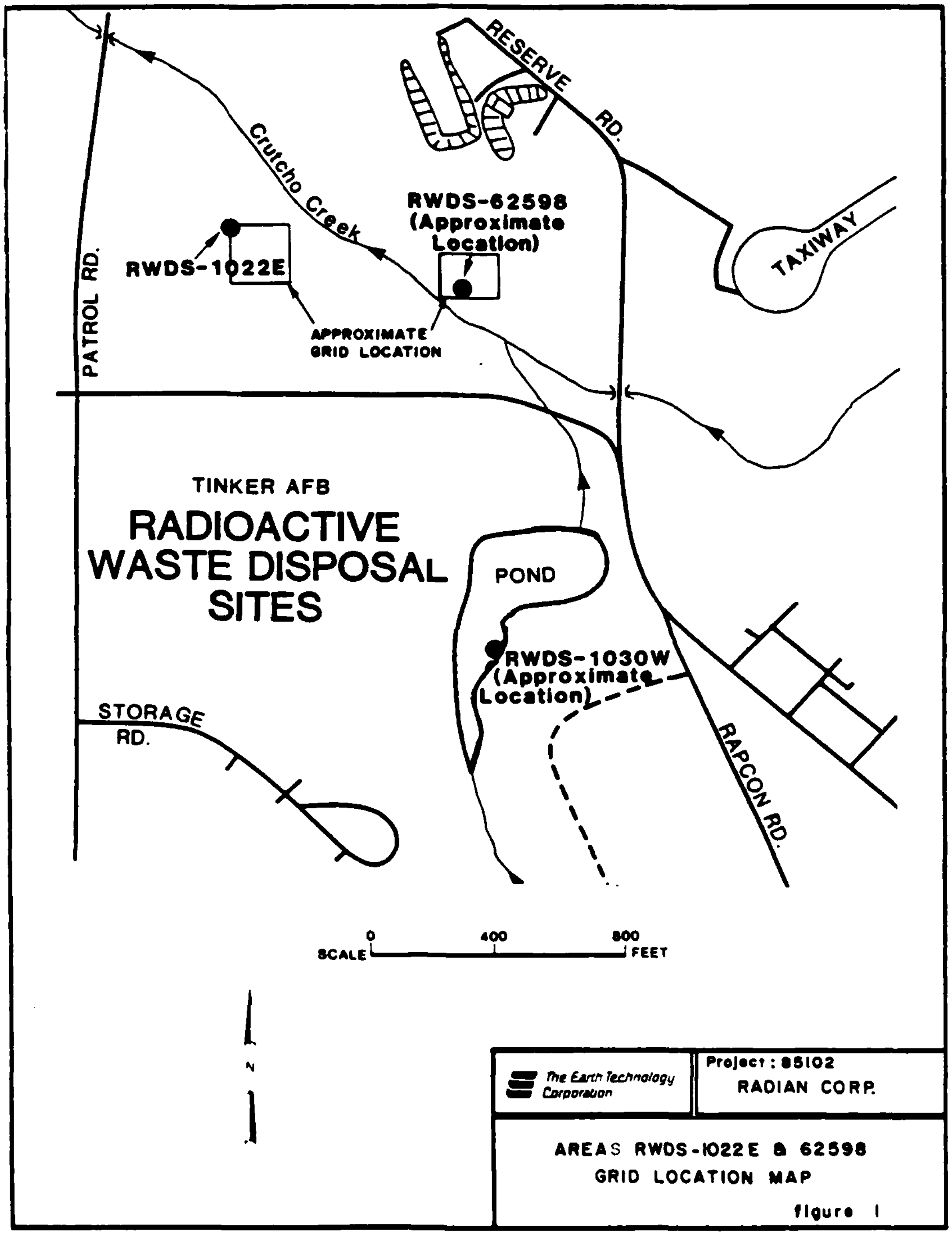
Specifications

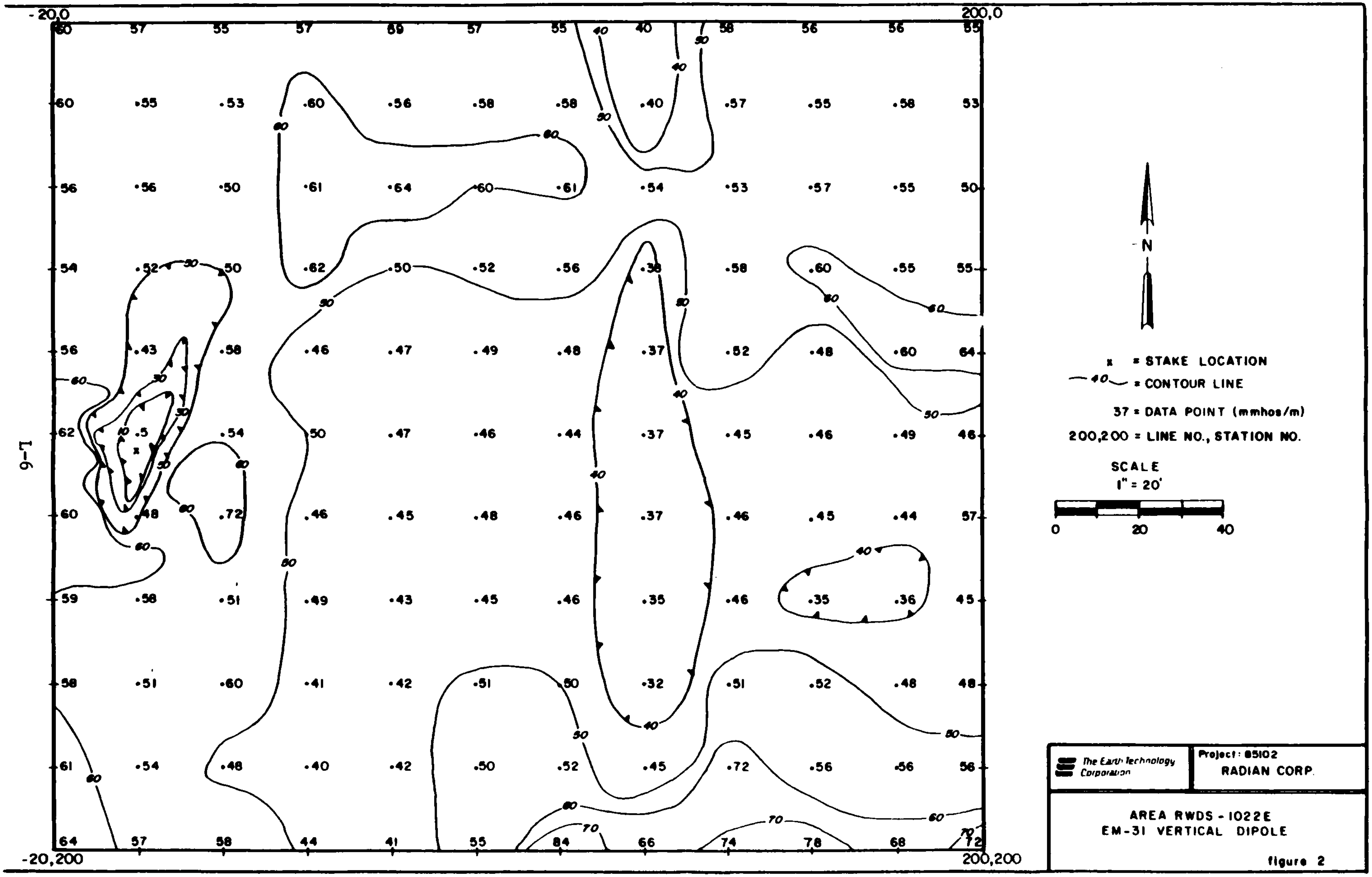
Dynamic Range	18,000 to 110,000 gammas. Roll-over display feature suppresses first significant digit upon exceeding 100,000 gammas.
Tuning Method	Tuning value is calculated accurately utilizing a specially developed tuning algorithm
Automatic Fine Tuning	± 15% relative to ambient field strength of last stored value
Display Resolution	0.1 gamma
Processing Sensitivity	± 0.02 gamma
Statistical Error Resolution	0.01 gamma
Absolute Accuracy	± 1 gamma at 50,000 gammas at 23°C ± 2 gamma over total temperature range
Standard Memory Capacity	
Total Field or Gradient	1,200 data blocks or sets of readings
Tie-Line Points	100 data blocks or sets of readings
Base Station	5,000 data blocks or sets of readings
Display	Custom-designed, ruggedized liquid crystal display with an operating temperature range from −40°C to +55°C. The display contains six numeric digits, decimal point, battery status monitor, signal decay rate and signal amplitude monitor and function descriptors.
RS 232 Serial I/O Interface	2400 baud, 8 data bits, 2 stop bits, no parity
Gradient Tolerance	6,000 gammas per meter (field proven)
Test Mode	A. Diagnostic testing (data and programmable memory) B. Self Test (hardware)
Sensor	Optimized miniature design. Magnetic cleanliness is consistent with the specified absolute accuracy.
Gradient Sensors	0.5 meter sensor separation (standard), normalized to gammas/meter. Optional 1.0 meter sensor separation available. Horizontal sensors optional.
Sensor Cable	Remains flexible in temperature range specified, includes strain-relief connector
Cycling Time (Base Station Mode)	Programmable from 5 seconds up to 60 minutes in 1 second increments
Operating Environmental Range	−40°C to +55°C; 0–100% relative humidity; weatherproof
Power Supply	Non-magnetic rechargeable sealed lead-acid battery cartridge or belt; rechargeable NiCad or Disposable battery cartridge or belt; or 12V DC power source option for base station operation.
Battery Cartridge/Belt Life	2,000 to 5,000 readings, for sealed lead acid power supply, depending upon ambient temperature and rate of readings
Weights and Dimensions	
Instrument Console Only	2.8 kg, 238 x 150 x 250mm
NiCad or Alkaline Battery Cartridge	1.2 kg, 235 x 105 x 90mm
NiCad or Alkaline Battery Belt	1.2 kg, 540 x 100 x 40mm
Lead-Acid Battery Cartridge	1.8 kg, 235 x 105 x 90mm
Lead-Acid Battery Belt	1.8 kg, 540 x 100 x 40mm
Sensor	1.2 kg, 56mm diameter x 200mm
Gradient Sensor (0.5 m separation - standard)	2.1 kg, 56mm diameter x 790mm
Gradient Sensor (1.0 m separation - optional)	2.2 kg, 56mm diameter x 1300mm
Standard System Complement	Instrument console; sensor; 3-meter cable, aluminum sectional sensor staff, power supply, harness assembly, operations manual.
Base Station Option	Standard system [redacted]
Gradiometer Option	Standard system [redacted] 0.5 meter sensor

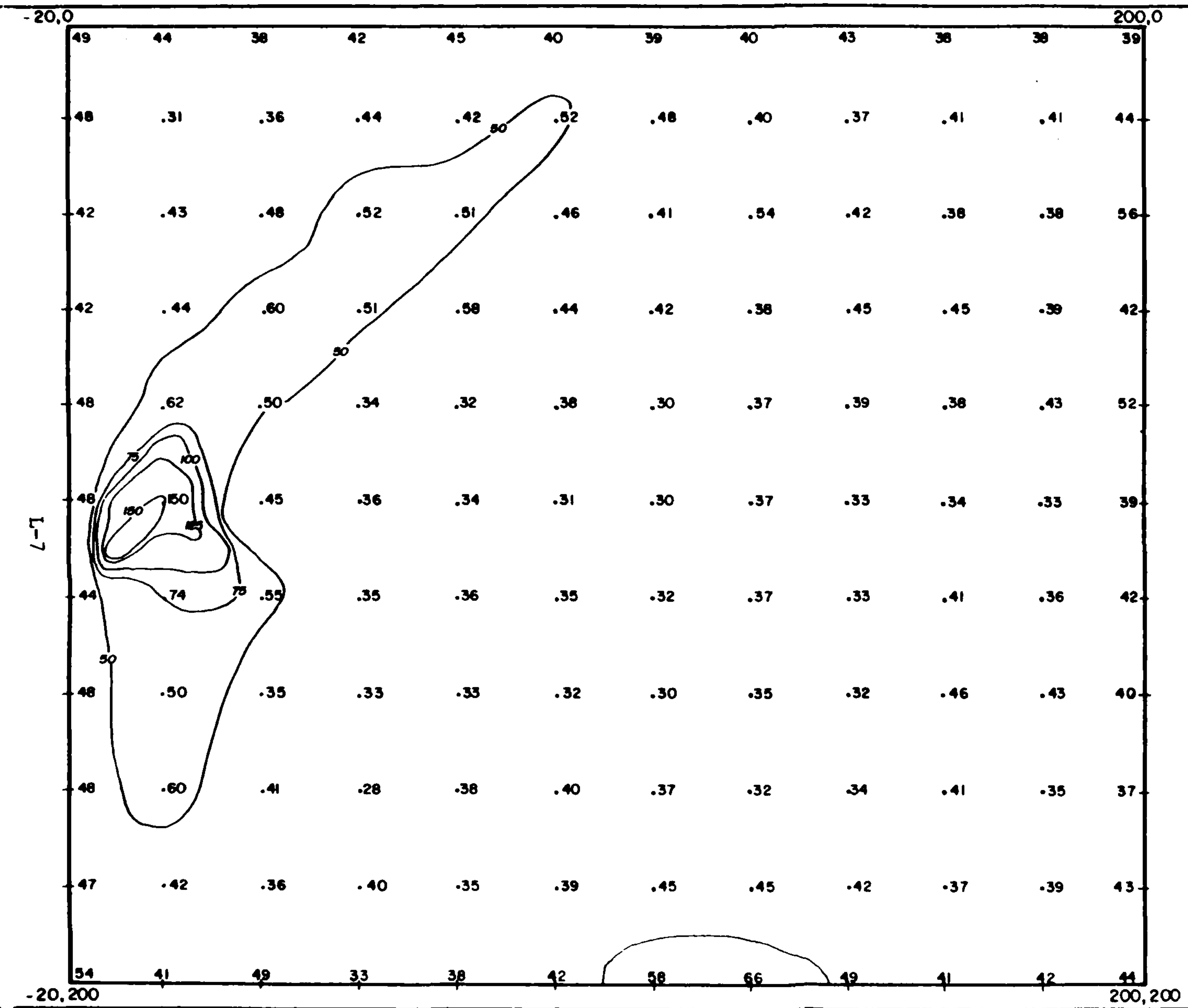
E D A Instruments Inc
4 Thorncliffe Park Drive
Toronto Ontario
Canada M4H 1H1
Telex 06 23222 EDA TOR
Cable Instruments Toronto
(416) 425 7800

In U S A
E D A Instruments Inc
5151 Ward Road
Wheat Ridge Colorado
U S A 80033
(303) 422 9112

Printed in Canada


RESERVE RD.
Crutcho Creek
RWDS-62598
(Approximate
Location)
TAXIWAY
PATROL RD.
RWDS-1022E
APPROXIMATE
GRID LOCATION
TINKER AFB
RADIOACTIVE
WASTE DISPOSAL
SITES
POND
RWDS-1030W
(Approximate
Location)
STORAGE
RD.
RAPCON RD.
SCALE 0 400 800 FEET
N
The Earth Technology Corporation
Project: 85102
RADIAN CORP.
AREAS RWDS-1022E & 62598
GRID LOCATION MAP
figure 1


-20,0
200,0
-20,200
200,200
N
x = STAKE LOCATION
40 = CONTOUR LINE
37 = DATA POINT (mmhos/m)
200,200 = LINE NO., STATION NO.
SCALE
1" = 20'
0
20
40
The Earth Technology Corporation
Project: 85102
RADIAN CORP.
AREA RWDS - 1022E
EM-31 VERTICAL DIPOLE
figure 2



40 = CONTOUR LINE

37 = DATA POINT (mmhos/m)

200,200 = LINE NO., STATION NO.

SCALE
1" = 20'

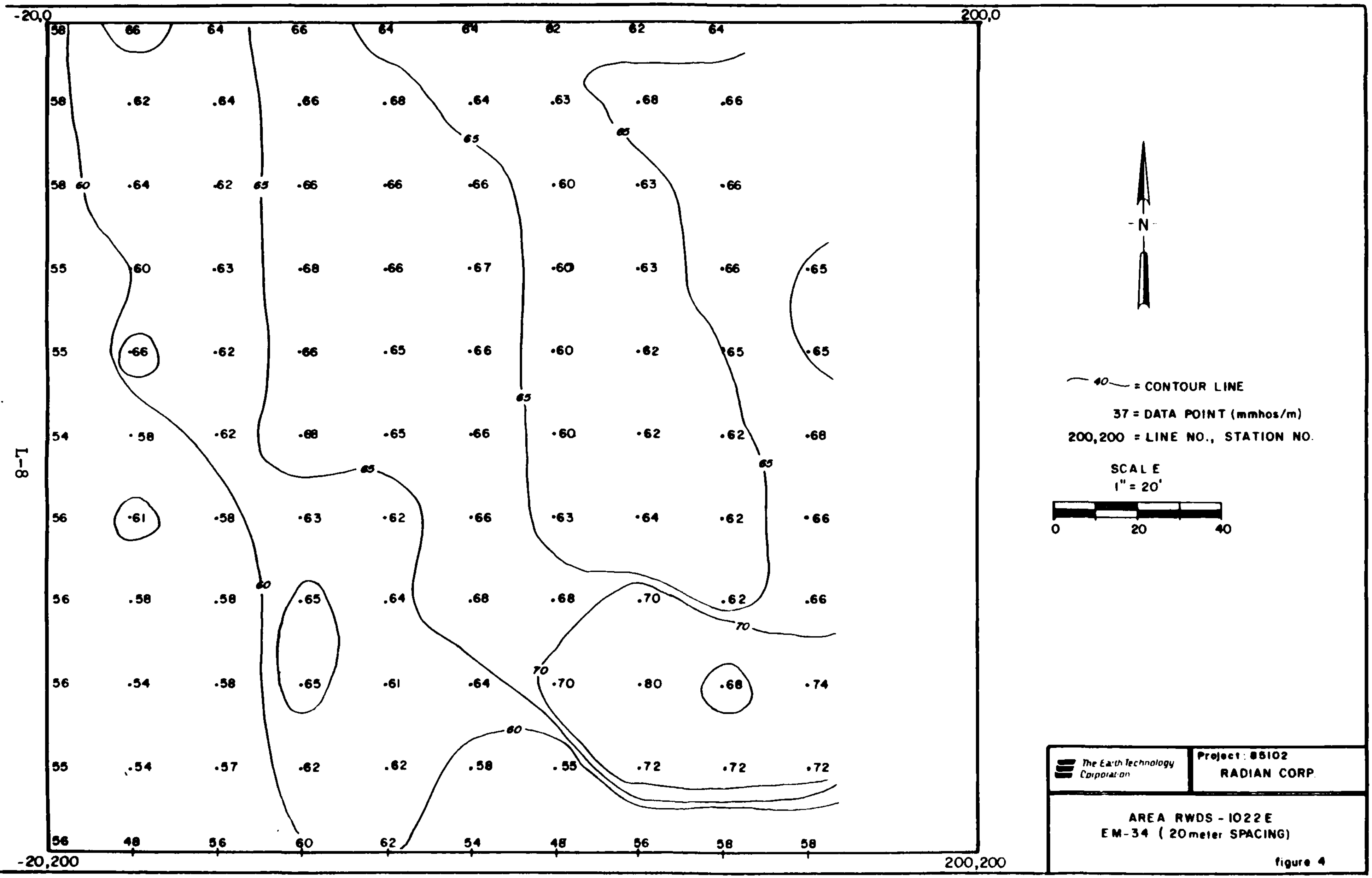
0 20 40

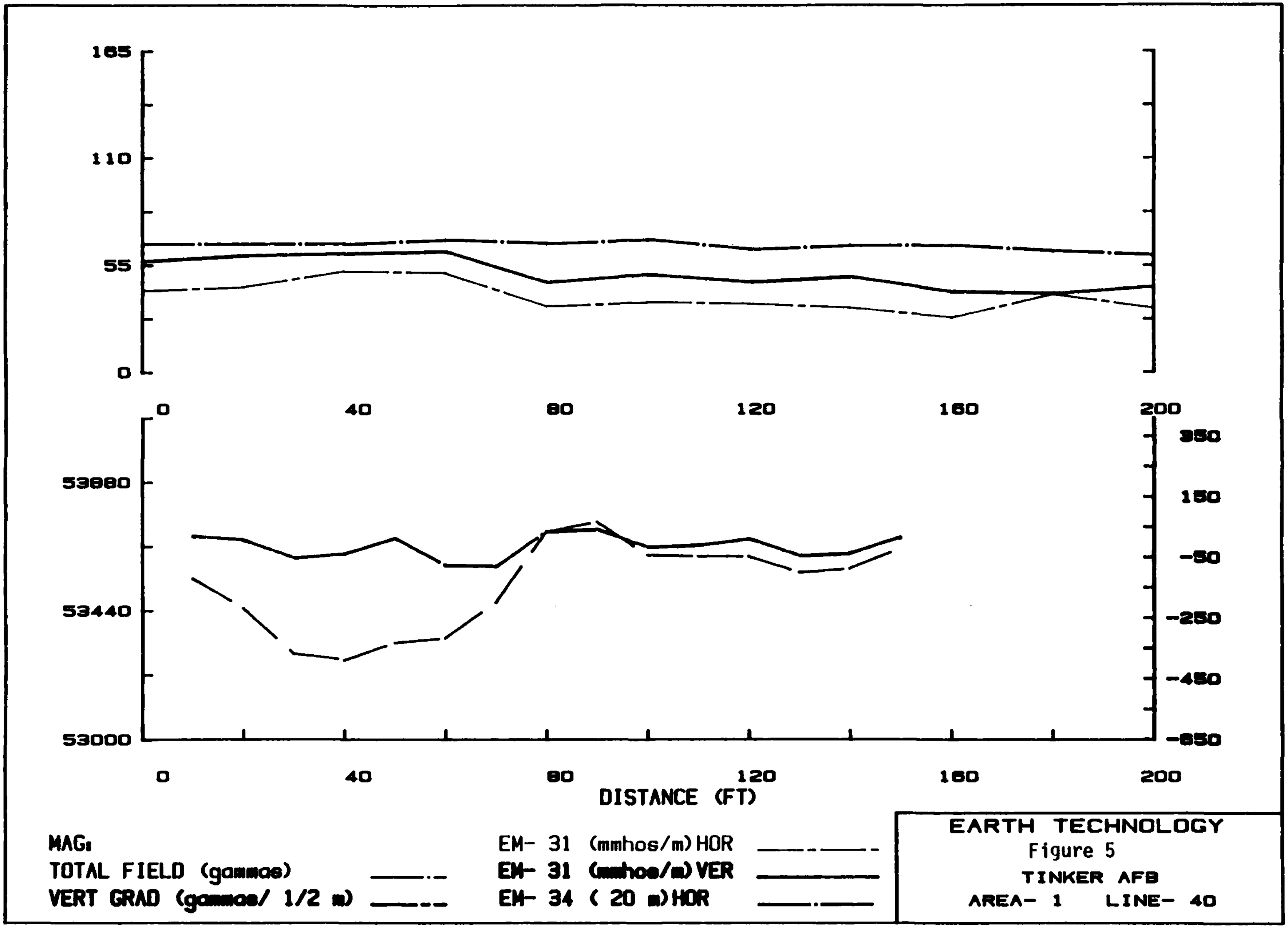
The Earth Technology Corporation

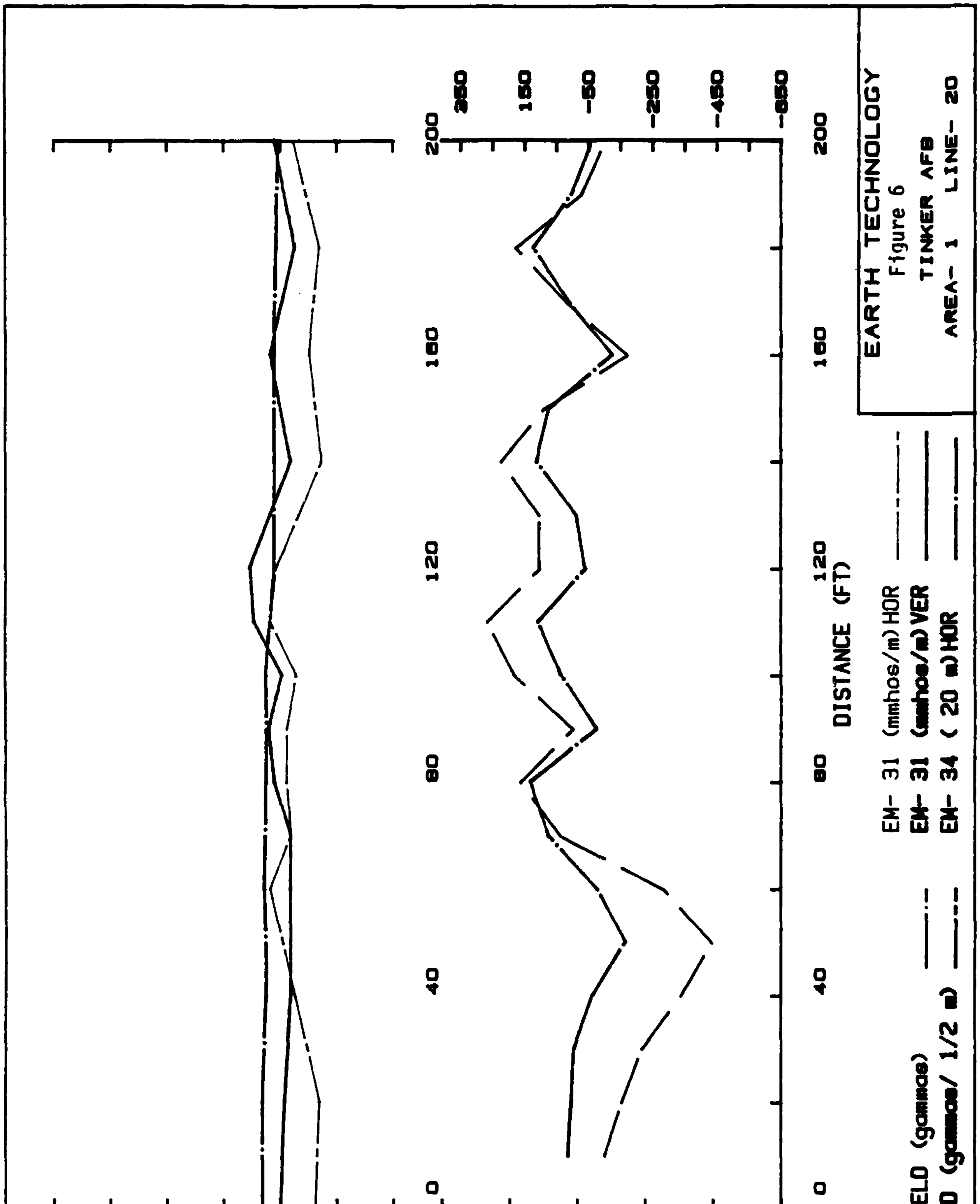
Project: 85102
RADIAN CORP

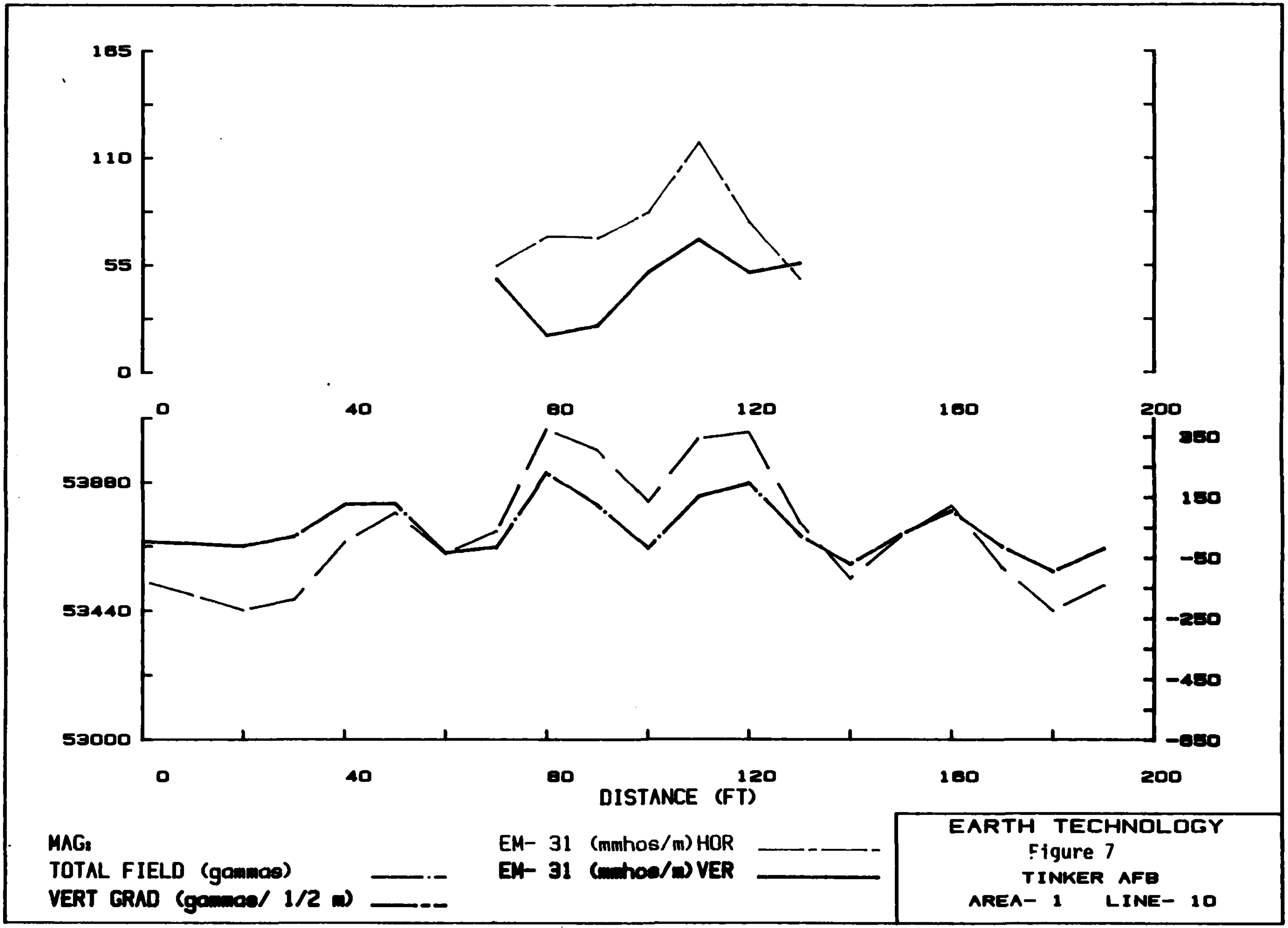
AREA RWDS - 1022 E
EM-31 HORIZONTAL DIPOLE

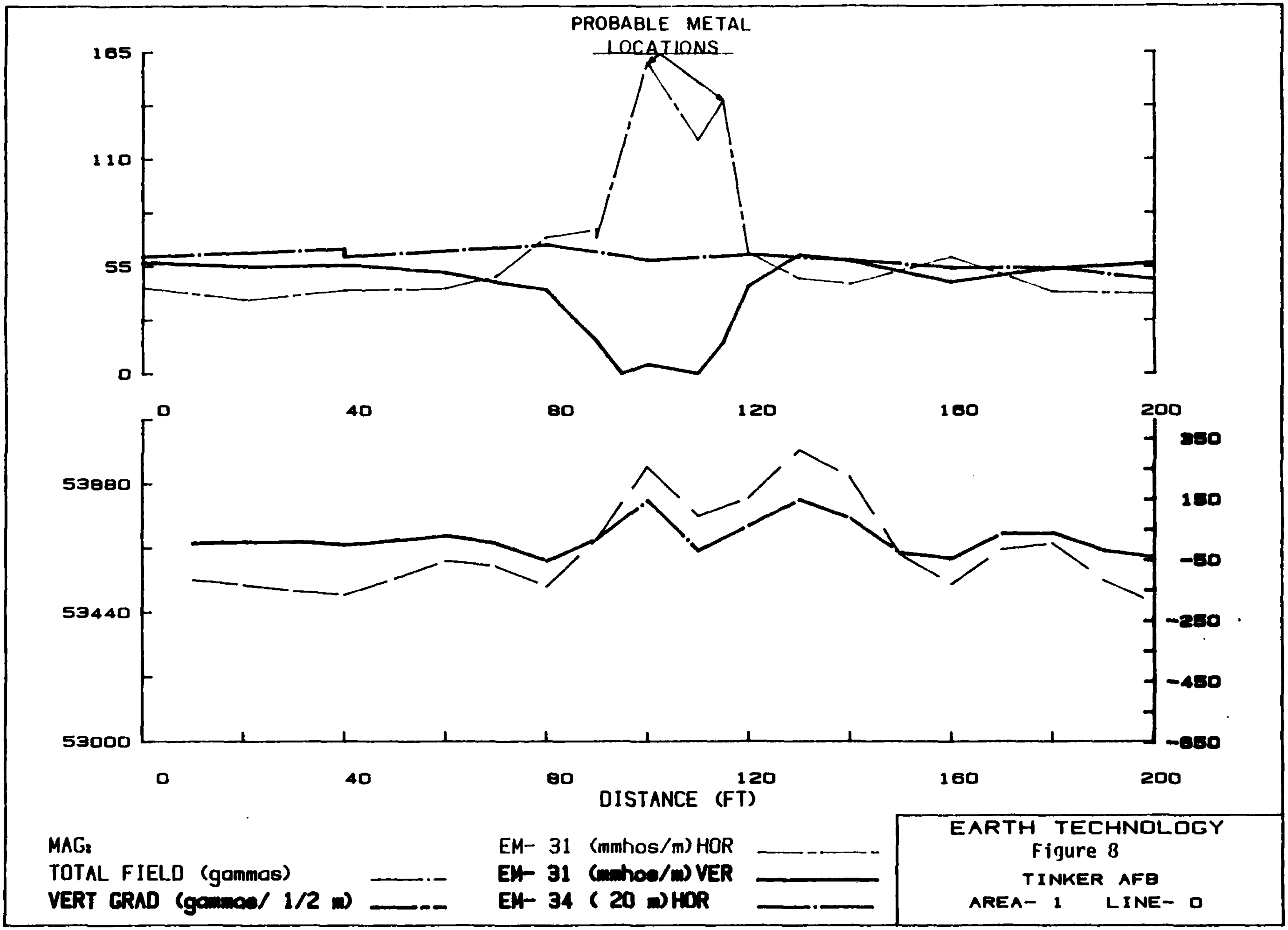
figure 3


-20,0
200,0
-20,200
200,200
N
40 = CONTOUR LINE
37 = DATA POINT (mmhos/m)
200,200 = LINE NO., STATION NO.
SCALE
1" = 20'
0
20
40
The Earth Technology Corporation
Project: 85102
RADIAN CORP.
AREA RWDS - 1022 E
EM-34 (20 meter SPACING)
figure 4

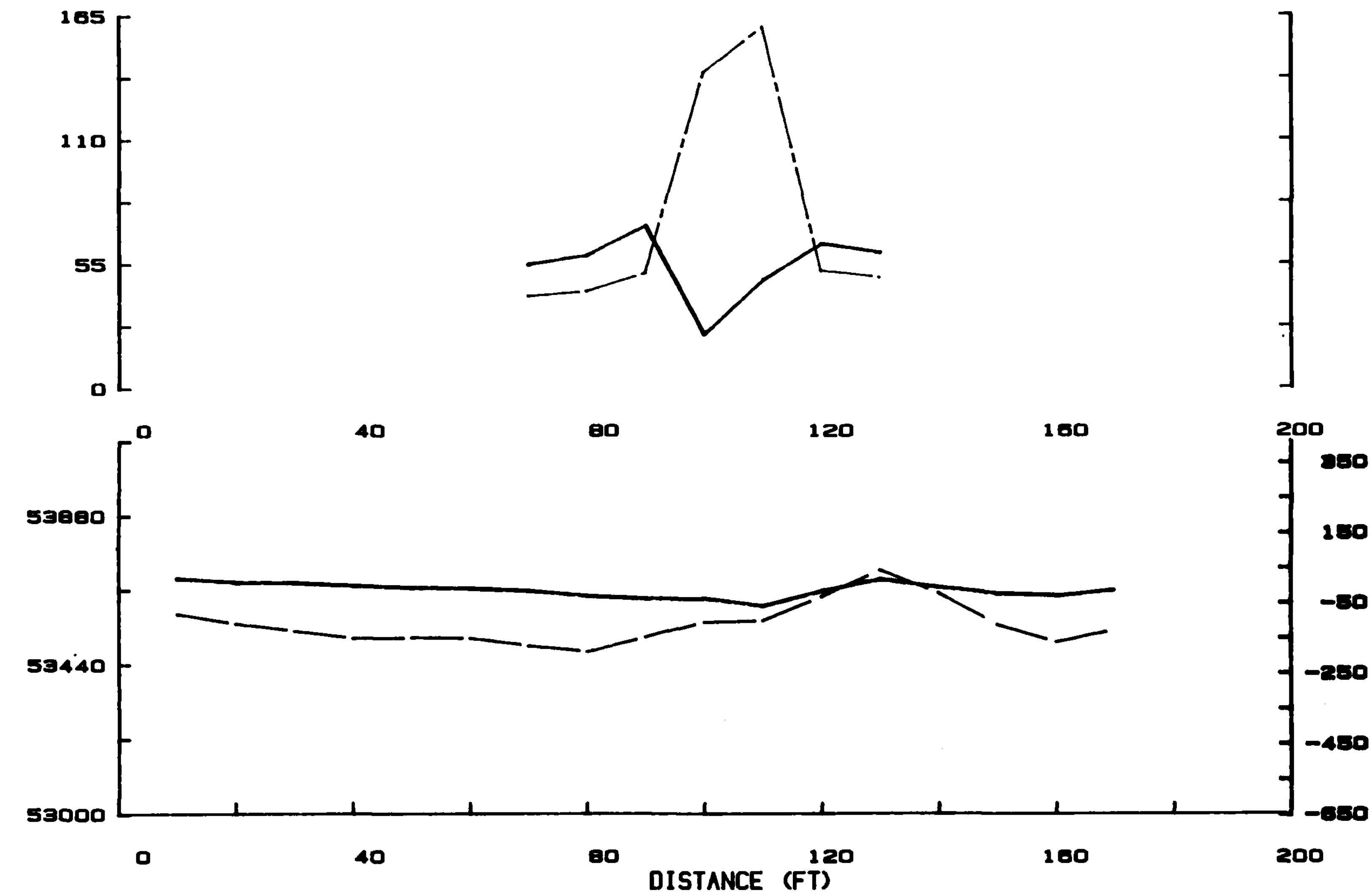

165
110
55
0
0
40
80
120
160
200
53880
53440
53000
350
150
-50
-250
-450
-650
0
40
80
120
160
200
DISTANCE (FT)
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EM- 34 (20 m) HOR
EARTH TECHNOLOGY
Figure 5
TINKER AFB
AREA- 1 LINE- 40


EARTH TECHNOLOGY
Figure 6
TINKER AFB
AREA- 1 LINE- 20
165
110
55
0
53880
53440
53000
350
150
-50
-250
-450
-650
0
40
80
120
160
200
DISTANCE (FT)
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EM- 34 (20 m) HOR


165
110
55
0
0
40
80
120
160
200
53880
53440
53000
350
150
-50
-250
-450
-650
0
40
80
120
160
200
DISTANCE (FT)
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EARTH TECHNOLOGY
Figure 7
TINKER AFB
AREA- 1 LINE- 10



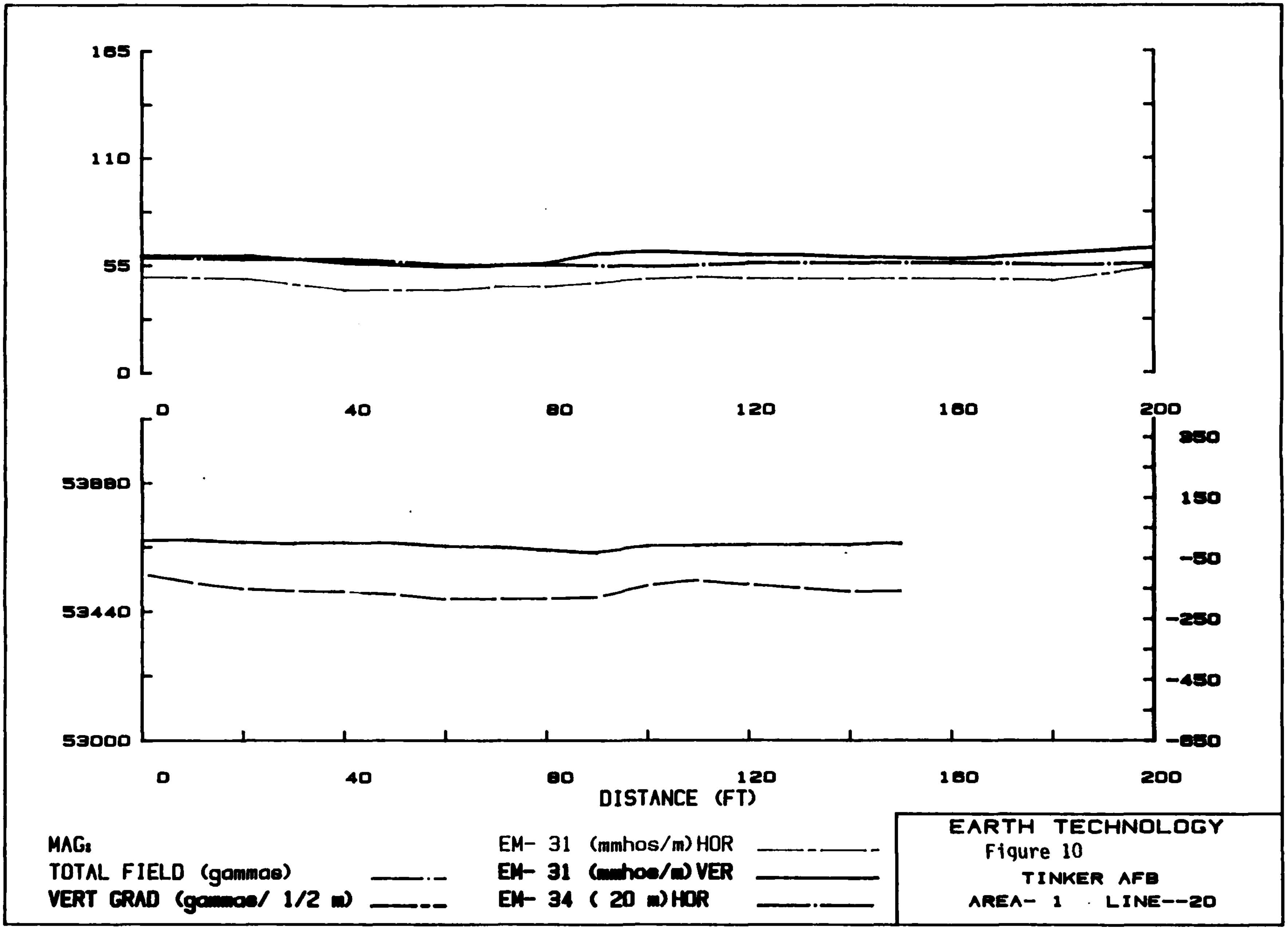
PROBABLE METAL LOCATIONS
165
110
55
0
0
40
80
120
160
200
53880
53440
53000
350
150
-50
-250
-450
-650
DISTANCE (FT)
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EM- 34 (20 m) HOR
EARTH TECHNOLOGY
Figure 8
TINKER AFB
AREA- 1 LINE- 0

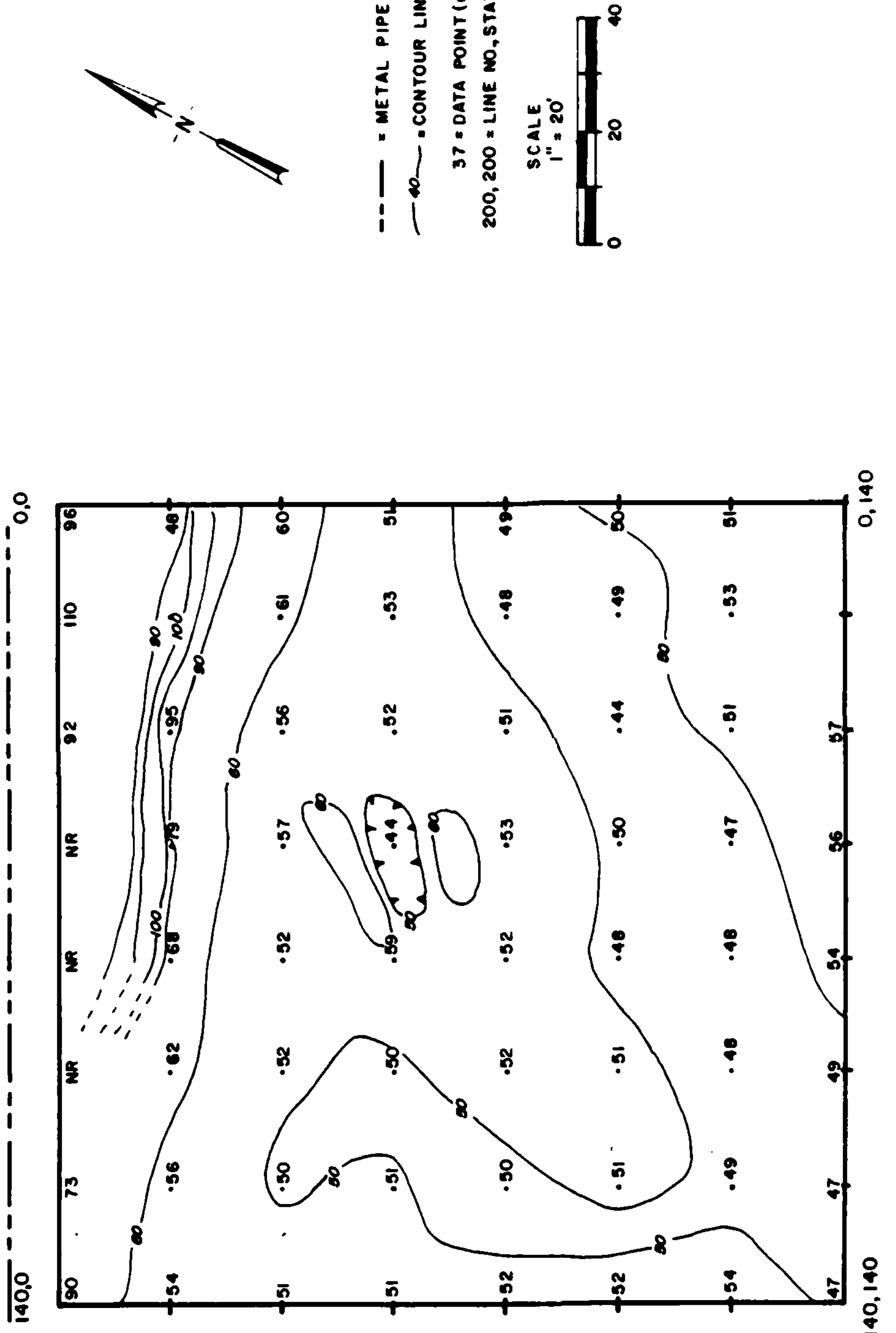


MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)

EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER

EARTH TECHNOLOGY
Figure 9
TINKER AFB
AREA- 1 LINE--10


165
110
55
0
0
40
80
120
160
200
53880
53440
53000
350
150
-50
-250
-450
-650
0
40
80
120
160
200
DISTANCE (FT)
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EM- 34 (20 m) HOR
EARTH TECHNOLOGY
Figure 10
TINKER AFB
AREA- 1 LINE--20



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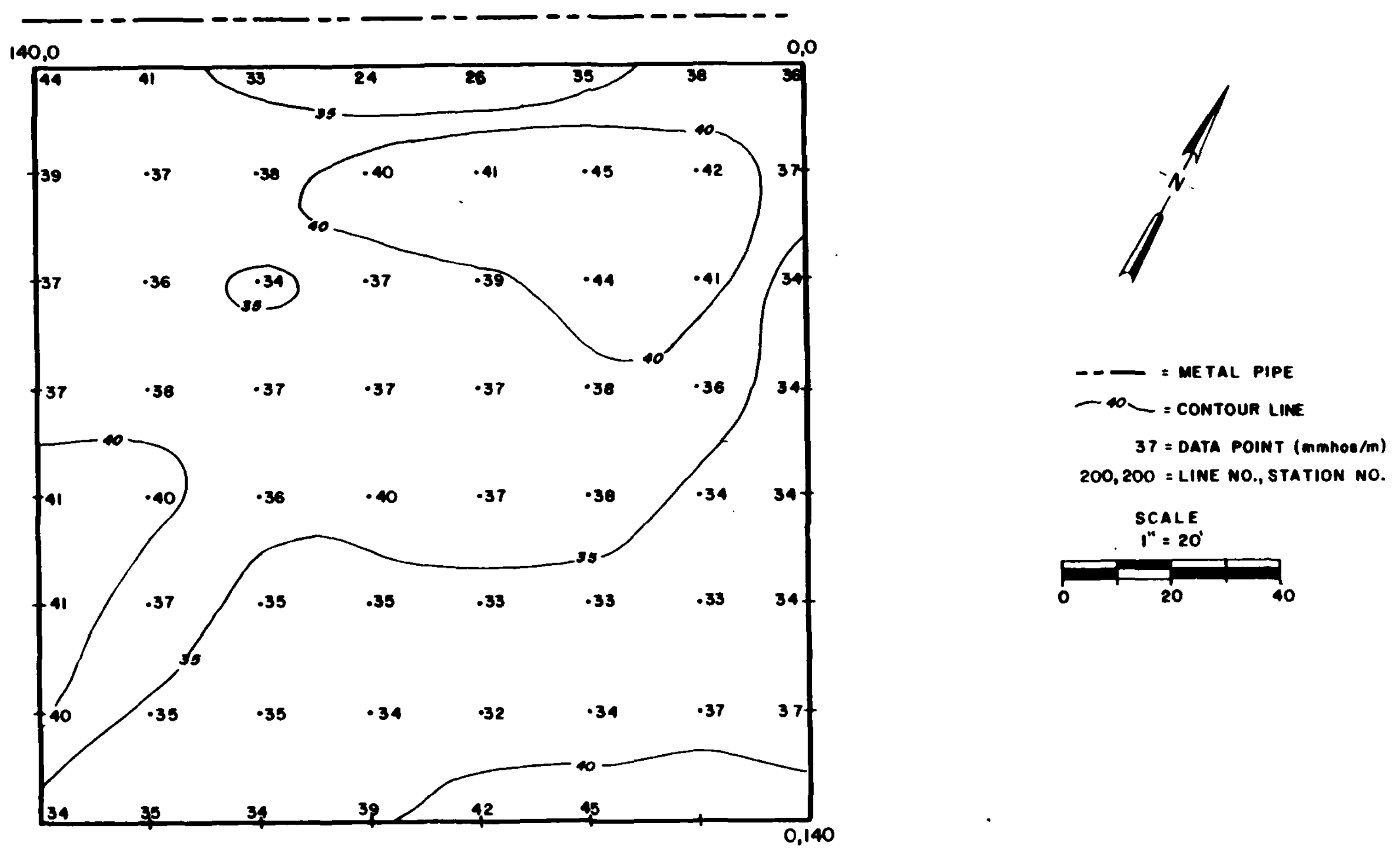
Project: 85102
RADIAN CORP.

AREA RWDS-62598
EM-31 VERTICAL DIPOLE

figure 11

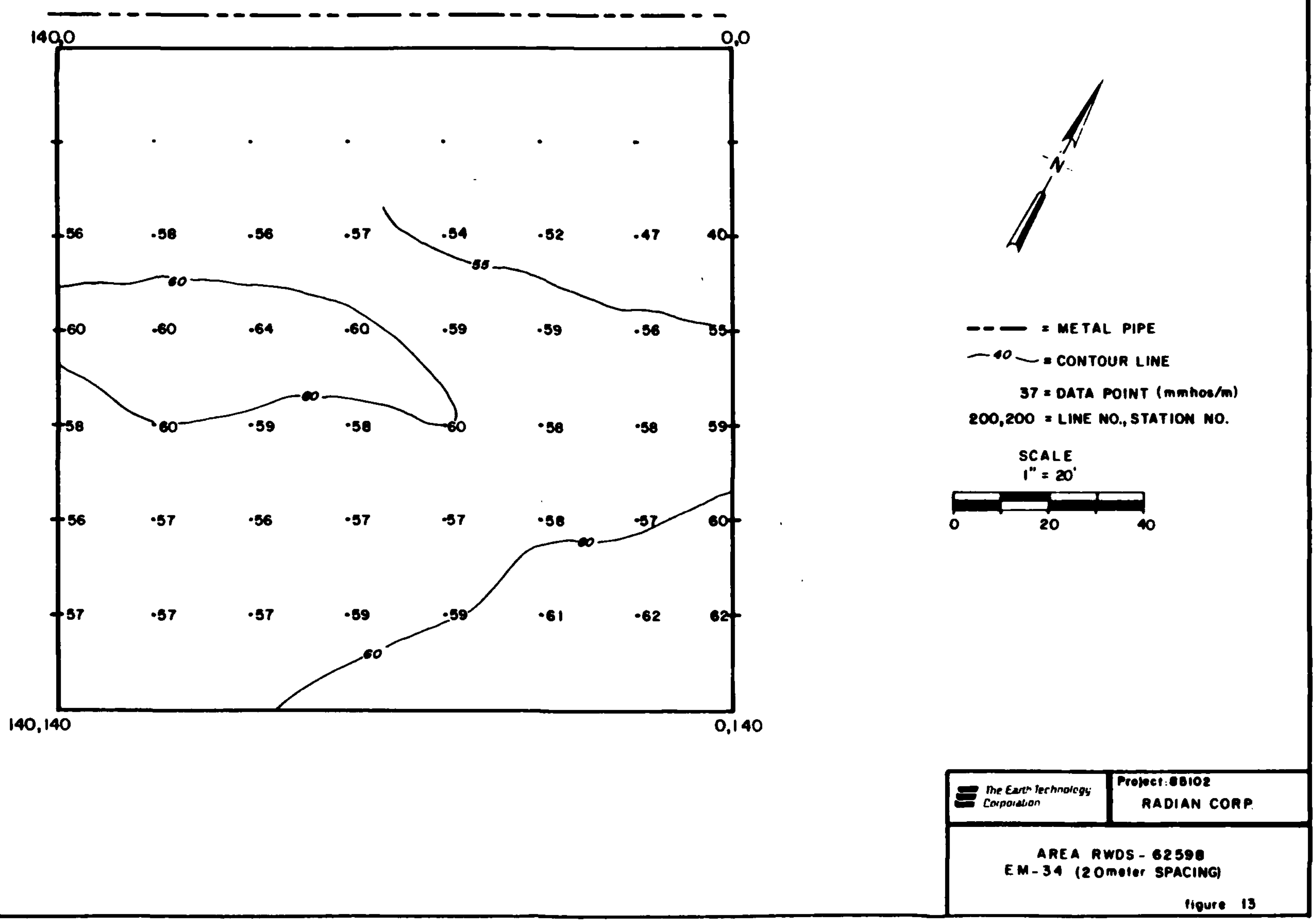


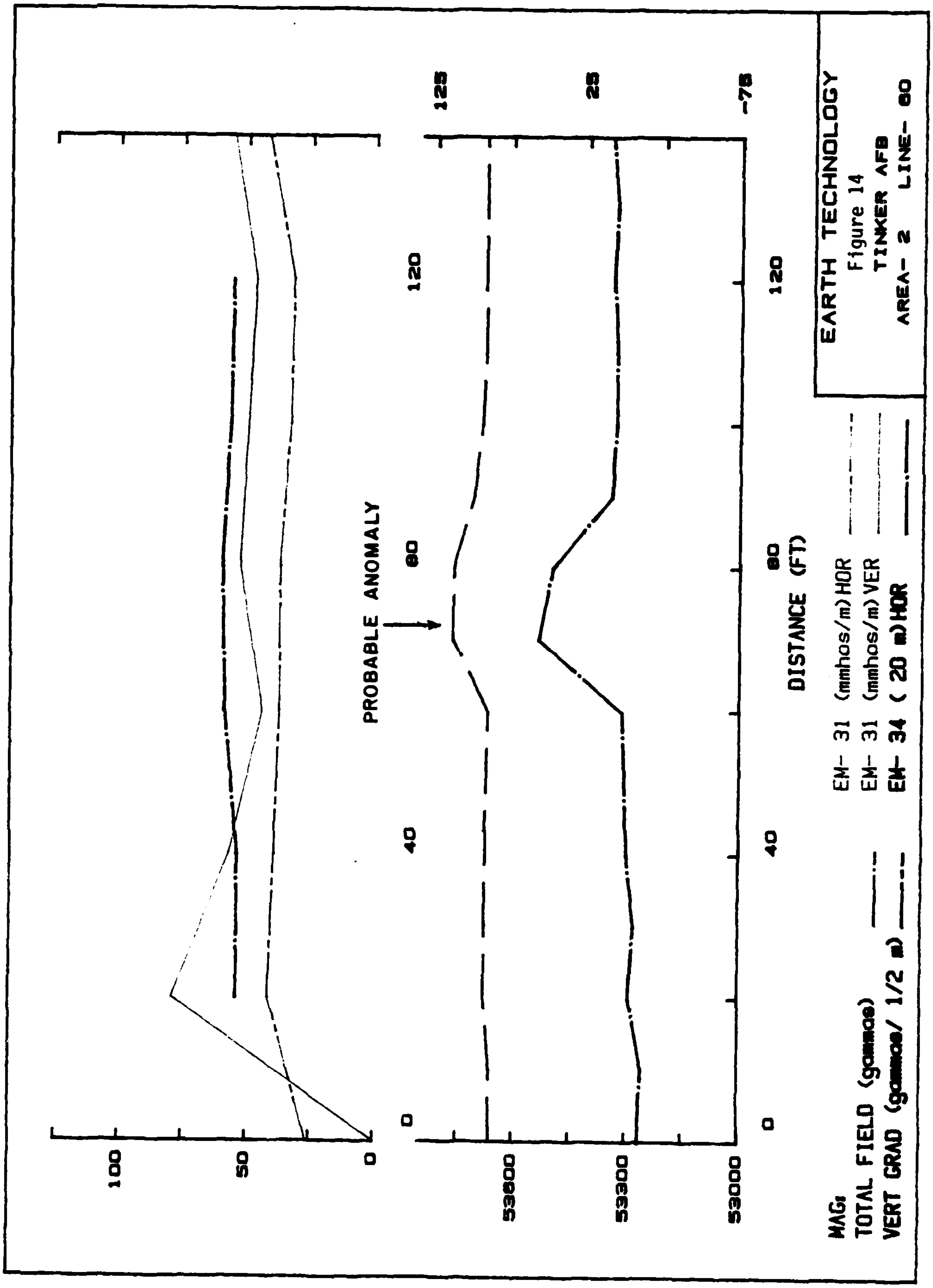
The Earth Technology Corporation

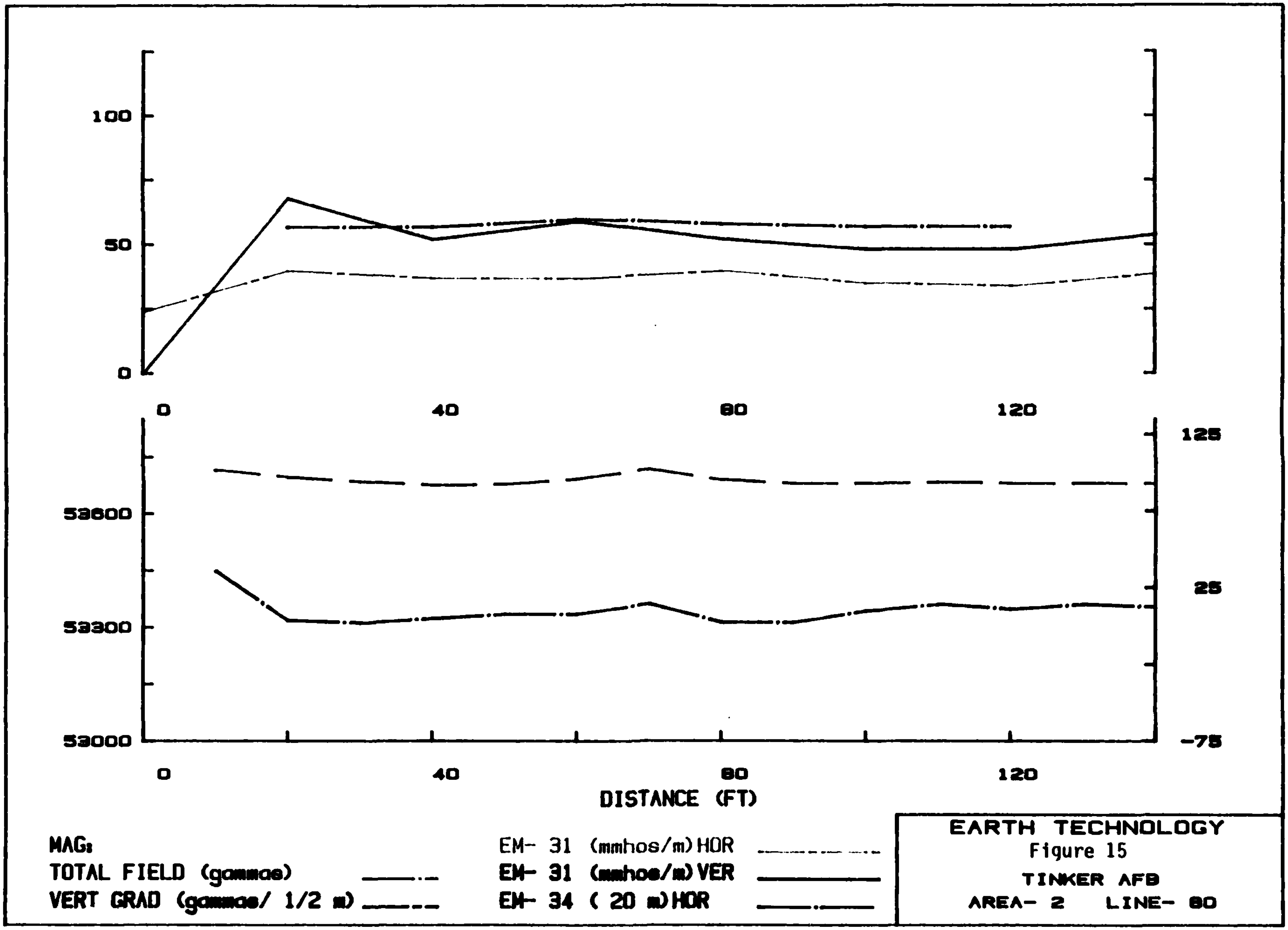
Project: 85102
RADIAN CORP

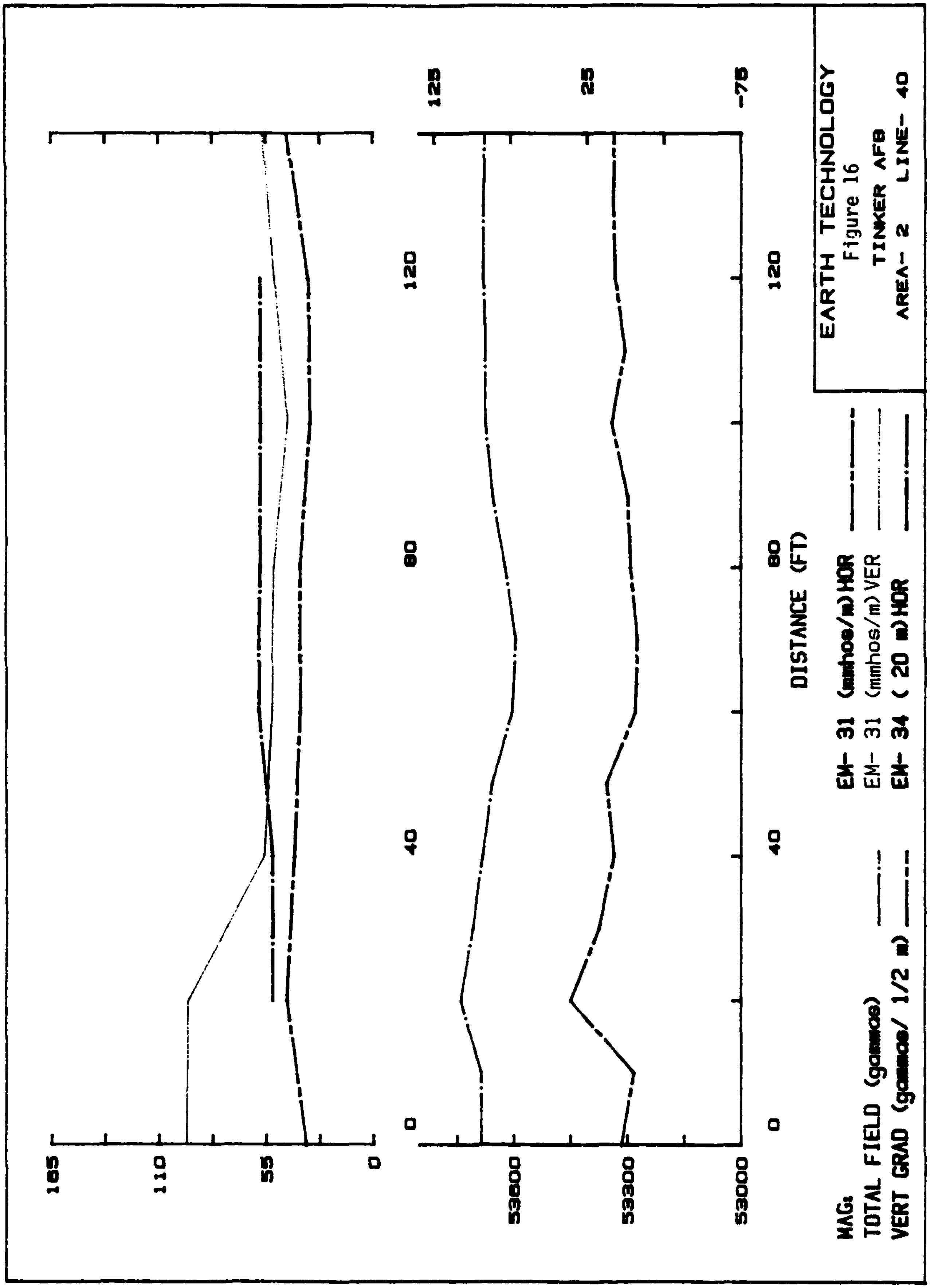
AREA RWDS-62598
EM-31 HOR'ONTAL DIPOLE

figure 12


140,0
0,0
140,140
0,140
N
= METAL PIPE
40 = CONTOUR LINE
37 = DATA POINT (mmhos/m)
200,200 = LINE NO., STATION NO.
SCALE
1" = 20'
0
20
40
The Earth Technology Corporation
Project: 86102
RADIAN CORP.
AREA RWDS - 62598
EM-34 (20meter SPACING)
figure 13


EARTH TECHNOLOGY
Figure 14
TINKER AFB
AREA- 2 LINE- 60
PROBABLE ANOMALY
DISTANCE (FT)
0
40
80
120
100
50
0
53600
53300
53000
125
25
-75
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EM- 34 (20 m) HOR


100
50
0
53600
53300
53000
0
40
80
120
125
25
-75
DISTANCE (FT)
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EM- 34 (20 m) HOR
EARTH TECHNOLOGY
Figure 15
TINKER AFB
AREA- 2 LINE- 80


EARTH TECHNOLOGY
Figure 16
TINKER AFB
AREA- 2 LINE- 40
MAG:
TOTAL FIELD (gammas)
VERT GRAD (gammas/ 1/2 m)
EM- 31 (mmhos/m) HOR
EM- 31 (mmhos/m) VER
EM- 34 (20 m) HOR
DISTANCE (FT)
0
40
80
120
165
110
55
0
125
25
-75
53600
53300
53000

RADIAN
CORPORATION

APPENDIX M

Safety Plan Utilized on this Project

DCN 83-212-027-04-01

TINKER AFB IRP PHASE IIB
SAFETY AND HEALTH PLAN

Prepared by:
Fred B. Blood

25 October 1983

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION

The purpose of this project is to determine if environmental contamination has occurred from the waste disposal practices at Tinker AFB, OK. The project consists of a variety of field activities; the installation of wells and sample collection, analysis of samples, and reporting. This safety plan is to address the field activities.

The following activities are required in the field portion of the project:

- o Installation of six deep sampling wells utilizing an air rotary drilling rig (open hole drilling prior to well casing installation). These wells are not situated directly over the waste site, but they may pass through contaminated ground water.

- o Drilling of five soil borings utilizing a hollow-stem auger. These soil borings are directly over a waste site.

- o Collection of 16 well water samples, six from the newly completed deep wells, eight from existing shallow ground water wells, and two from the soil boring holes.

- o Collection of 30 soil samples from the soil boring holes.

- o Collection of five leachate samples from existing seeps.

- Collection of four water samples from an existing recreational impoundment.

- Performance of surface geophysical testing.

There exists a reasonable probability that all of these activities, with the exception of the geophysical testing, will result in contact with waste contaminated materials. The waste materials include pesticide containers, a wide variety of solvents (including trichloroethylene), metal plating wastes, fuels and oils and radioactive wastes. It is considered highly improbable that radioactivity will be encountered in any samples except the impoundment water samples, and there in low to background levels.

2.0 RATIONALE OF SAFETY APPROACH

The Supervising Geologist is responsible for the proper execution of the safety plan described herein which is for the prevention of deleterious exposure to hazards associated with the handling of toxic wastes. Additionally, typical safety practices related to drilling activities must also be observed (use of safety hats, shoes, and life vests in boat use, etc.). These safety and health practices are to be observed by all Radian personnel and subcontractor personnel.

The potential for worker exposure to fumes and vapors requires gas-proof eye protection. This is accomplished by using full-face respirators. Respiratory protection must include organic vapor, acid gas, and fume protection. The expected concentrations should be within the capacity of air purifying respirator protection. Ambient air monitoring will be performed to provide an indication of excessive levels, which will then require increased protections. The collection of and working with aqueous samples requires splash protection, to be provided by coveralls and jackets. The handling of samples that may contain a wide range of solvents, including trichloroethylene, requires two-layer hand protection.

This safety program is established as a minimum requirement. Variations from the program for greater protection will not be discouraged. However, decreasing the protection must be authorized by the Supervising Geologist or the Project Director. Program changes will be documented in the after-action report.

3.0 SAFETY TRAINING

Prior to the initiation of site activities, a training session will be held to discuss the proposed work, associated safety and health plans, and emergency response plans. All personnel assigned to drilling activities and water sampling efforts will be instructed regarding the potential health and safety hazards associated with the work and protective measures available. Specifically, the following topics will be covered in the training session:

- Potential routes of contact with toxic and/or corrosive substances
  - skin contact/adsorption
  - eye contact
  - inhalation
  - ingestion

- Types, proper use, limitations and maintenance of applicable protective clothing and equipment
  - safety helmet
  - industrial safety glasses
  - chemical goggles
  - chemical resistant gloves
  - chemical resistant safety-toe boots
  - chemical resistant body coverings (apron, blouse, trousers, coveralls)

- Respiratory protection using half- and full-facepiece air purifying respirator with replaceable filter cartridges
  - Hierarchy of protective controls: engineered, administrative, work practice, personal protective clothing and equipment.

- Forms of respiratory protection: air purifying (disposal/reusable), air supplied, self contained.

- Selection of respiratory protection based on hazard: dust, fume, mist, gas, irritant, warning properties.

- NIOSH certification/approval of respiratory protection equipment.

- Medical/physical/physiological fitness to wear respiratory protection (e.g., spirometry, clean shaven, etc.).

- Reevaluation of respirator selection.

- Use, limitations and maintenance of full-facepiece air-purifying respirator: qualitative fit test, routine inspection, replacement of parts, cleaning/disinfection, storage.

- Use, limitations and maintenance of half-facepiece air-purifying respirator: qualitative fit test, routine inspection, replacement of parts, cleaning/disinfection, storage.

o Reporting of accidents and availability of medical assistance.

4.0 PROTECTIVE CLOTHING AND EQUIPMENT

All monitoring well installation work will be performed by persons wearing the following required personal protective equipment:

- PVC bib overalls
- PVC jacket
- Gauntlet style, chemical resistant, Viton gloves over butyl rubber gloves
- Chemical resistant safety toe, steel shank boots
- Respirator (full-facepiece air purifying)
- Safety helmet

Depending on site conditions and drilling conditions, other items may be used for supplemental protection. Such items may include:

- Tyvek® coveralls
- Chemical resistant apron
- Respirator (half-facepiece, air purifying)
- Chemical eye goggles or safety spectacles with side shields

Because of the potential for migration of contaminants into and through the shallow aquifer zone, well-defined disposal site boundaries are uncertain. Several disposal sites have a high potential for migration of contaminants. Most of the monitoring wells will be installed in areas hydraulically down-gradient of known disposal sites or in areas of unknown ground water flow direction. Since the degree of contamination and potential migration patterns of contaminants are not known, respirator use will be required as a precaution during all drilling activities and well installation work. Full-facepiece air purifying

respirators will be used with Ultra-Twin GMC Cartridges for acid gases, dust and fume protection, and organic vapors. The Supervising Geologist may decide to implement the use of half-facepiece, air purifying respirators depending on specific site and drilling conditions. Only when well installation work is being performed in areas hydraulically up-gradient of respective sites and when there is considerable confidence that well locations are outside zones of possible cross-contamination, may respirator use be discontinued.

5.0 WORK ZONES AND DECONTAMINATION PROCEDURES

To minimize the transfer of hazardous substance(s) from the site, contamination control procedures are needed. Contaminants must be removed from people and equipment prior to relocation from a work zone.

5.1 Work Zones

Prevention of exposures and spread of contamination will be controlled through the establishment of work zones. Two primary work zones will be utilized and will be referred to as the (1) Exclusion Zone and (2) Decontamination Zone.

The Exclusion Zone is the area where disturbance activities are conducted and where contaminants are or may be present. Only those properly trained individuals attired in the specific protective clothing and equipment will be allowed to enter and work in this zone.

The Decontamination Zone is the area where personnel and equipment will be decontaminated before moving to the next site.

The Exclusion Zone will comprise a 25-foot radius circle around the monitoring well and the Decontamination Zone will comprise a 25-foot wide ring around the Exclusion Zone as shown in Figure 5-1.

5.2 Decontamination Procedures

Personal protective equipment and drilling/sampling equipment can become contaminated in a number of ways including:

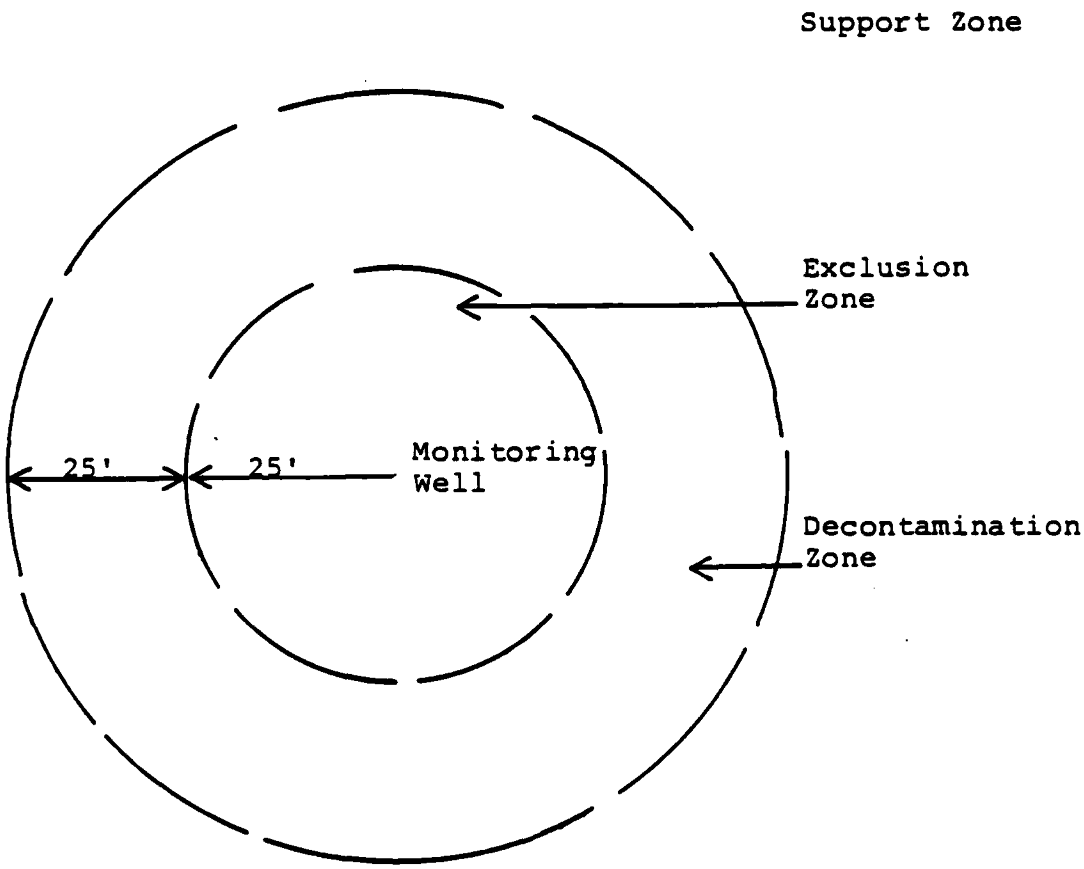


Figure 5-1. Monitoring Well Work Zone.

- Contacting vapors, gases, mists, or particulates in the air.

- Walking through puddles of liquids or on contaminated soil.

- Using contaminated instruments or equipment.

Protective clothing and respirators help prevent the wearer from becoming contaminated or inhaling contaminants, while good work practices help reduce contamination of protective clothing, instruments, and equipment. Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. Or in removing contaminated clothing, personnel may contact contaminants on the clothing and/or inhale them.

Decontamination consists of physically removing contaminants. How extensive decontamination must be depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough the decontamination must be. Combining decontamination, the correct method of doffing personnel protective equipment, and the use of site work zones minimizes cross-contamination from protective clothing to wearer, equipment to personnel, and one area to another.

Decontamination at the monitoring wells will be accomplished by physically removing contaminants from the surfaces of personal protective equipment and drilling/sampling equipment with detergent water followed by rinse with clean water. The process will be repeated (see Figure 5-2).

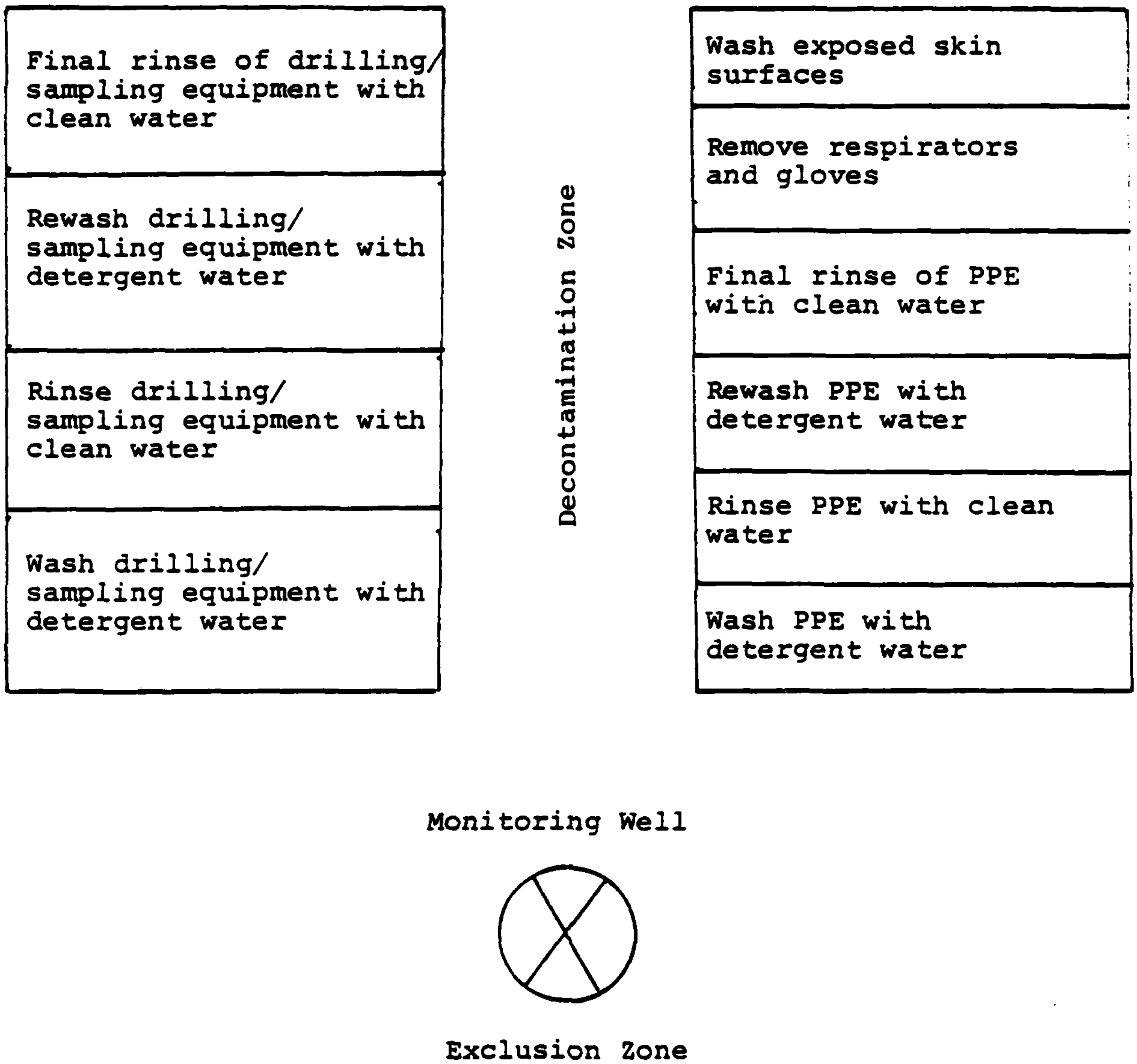


Figure 5-2. Monitoring Well Decontamination Procedures.

6.0 SAFETY MONITORING

In addition to the use of personal protective equipment and respirator protection, safety support plans are also necessary. At Tinker AFB, safety support will constitute ambient air monitoring of hazardous and/or toxic materials for the protection of Radian and Air Force personnel and emergency response in the event of an employee injury or other medical emergency.

6.1 Ambient Air Monitoring

Ambient air monitoring will be performed using two techniques. One technique will use the combustible gas meter (TLV Sniffer) and the other will use colorimetric indicator tubes and the grab-sampling method. All readings must be documented (minimum 2/hole) in field notes.

Air monitoring will be performed during drilling activities to determine if the respiratory protection chosen affords adequate protection from contaminant concentrations found on-site.

6.1.1 TLV Sniffer

A Bacharach Instruments TLV Sniffer will be used to locate on-site organic vapor concentrations that are higher than ambient outdoor air concentrations. The instrument will be used to determine general areas of elevated organic vapor concentrations, and not as a precision analytical instrument. It is an instantaneous measuring instrument and displays concentrations on a meter in parts per million (ppm), referenced to hexane.

The TLV Sniffer displays a meter reading directly in parts per million (ppm) volatile flammable vapor allowing an estimate of combustible gas concentrations. The instrument can be calibrated to read directly in parts per million for any one of many kinds of combustible gases. Factory calibration is for hexane unless otherwise specified, though readings from other gases and vapors may be interpreted easily by means of reading conversion curves (Figure 6-1).

6.1.2 Grab-Sampling Using Colorimetric Indicator Tubes

A Draeger® kit with an assortment of indicator tubes will be used to obtain quick analysis of unknown hazardous substances in air. The Draeger® tubes are colorimetric direct reading detector tubes and function as "real time" hazardous condition indicators. Samples will be collected during drilling activities. An initial screening tube (Polytest®) will be used for a general qualitative test. This tube will give a positive reaction indicating the presence of ethyl acetate, benzene, acetone, alcohol, and/or hydrocarbons. If a positive reaction does occur, more specific tests may be made using more specifically reacting Draeger® tubes. Table 6-1 lists the sampling strategy to be used when obtaining grab-samples via Draeger® tubes at Tinker AFB. In addition to the Polytest®, any of the detector tubes listed in Table 6-1 may be used individually if the presence of that compound is suspected.

The respirators selected for use at Tinker AFB have been assigned protection factors by the National Institute for Occupational Safety and Health (NIOSH). These respirator protection factors are listed in Table 6-2. In event that sampling results indicate that the respective Threshold Limit Values (TLVs) may be exceeded, concentrations should be compared to the Protection

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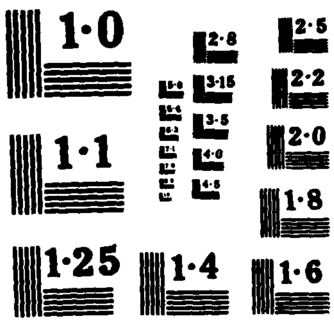
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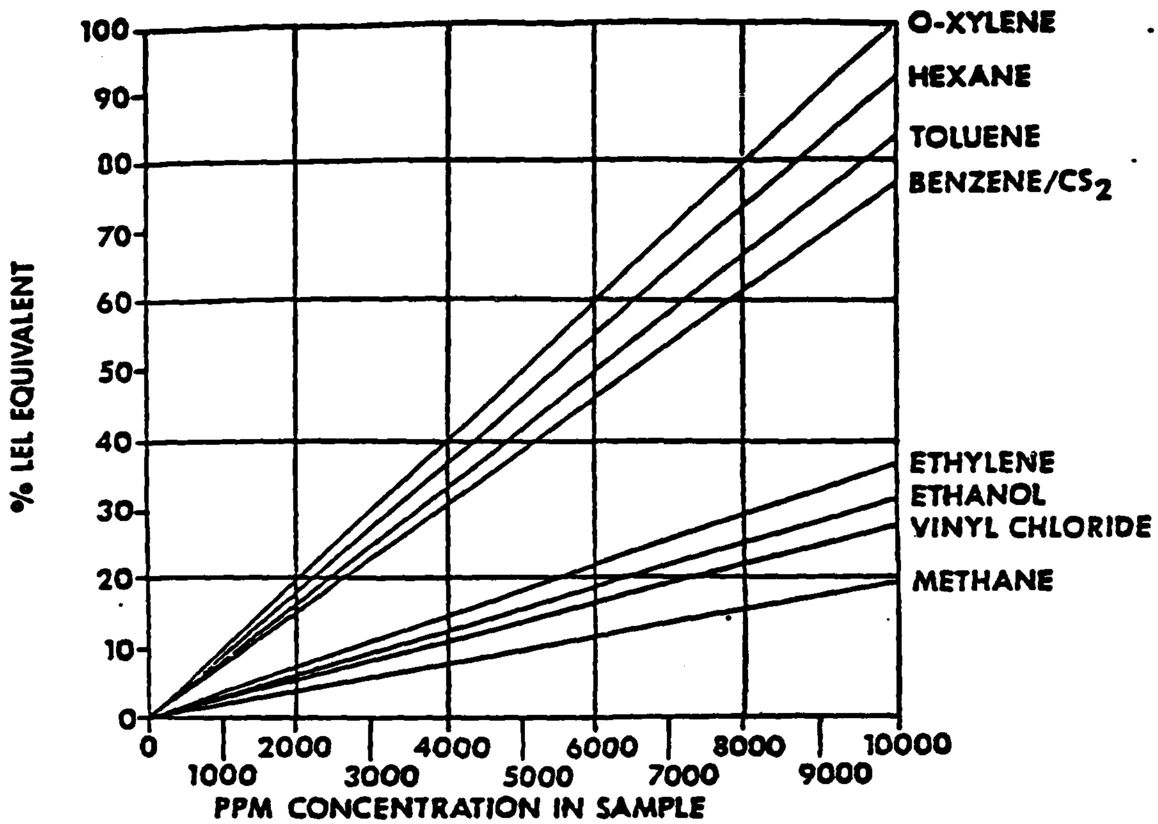

Figure 6-1. Conversion Curves Showing Relationship of PPM Concentrations of Various Gases to Percent L.E.L. Equivalents.

TABLE 6-1. DETECTOR TUBES FOR AMBIENT AIR MONITORING

Detector Tube[1]	Positive Reaction Indicates Presence of	Detection Limit	TLV (ACGIH 1982)	MUC[2]
1. Polytest	2, 3, 4, 5, 6*	50 ppm (benzene) 2000 ppm (acetone)		
2. Ethyl acetate 200/a	Esters, 3, 4, 5	200 ppm	400 ppm	1000 ppm
3. Benzene 0.05	Aromatic H/C	15 ppm	10 ppm	500 ppm
4. Acetone 100/b	Ketones	100 ppm	750 ppm	1000 ppm
5. Alcohol 100/a	Alcohols	100 ppm		
6. Hydrocarbon 0.1%/b	Aliphatic H/C	0.1% (butane)		
7. Sulfur dioxide 1/a	Sulfur dioxide	1 ppm	2 ppm	100 ppm
8. Hydrogen sulfide 1/c	Hydrogen sulfide	1 ppm	10 ppm	500 ppm

[1] List is a modification of the sampling strategy for unknown substances developed by National Draeger, Inc. Tubes are manufactured by National Draeger, Inc.

[2] MUC = Maximum Use Concentration based on full-faced respirators. If levels exceed this value, respiratory protection must be increased.

* A positive test also occurs for arsin, carbon disulfide, nitric oxide, carbon monozide, and methyl bromide.

TABLE 6-2. RESPIRATOR PROTECTION FACTORS

Type Respirator	Facepiece Pressure	Protection Factor
Half- or Quarter-mask, High-Efficiency Air Purifying	negative	10*
Full Facepiece, High Efficiency Air Purifying	negative	50*

* These Protection Factors pertain to properly fitted facepieces with new cartridges and filters.

Factor associated with the particular respirator in use. If the concentrations of contaminants are not conservatively within the listed Protection Factor, work activities will be terminated until satisfactory respiratory protection can be obtained.

6.2 Personal/Site Hygiene

Punctured, internally contaminated, cracked, stubbornly soiled, protective items will be disposed in sealed plastic bags.

Paper, rags, and other disposables used on-site or in equipment/sample container clean up will be disposed of in sealed plastic bags.

No food will be consumed on the exploration site. Employees will thoroughly wash their hands, forearms and face before consuming food or beverages other than water held in disposal cups. Drinking water will be available at the perimeter of the site being investigated. Disposable cups will be used to consume water after protective gauntlet gloves are removed.

Soil cuttings from augering which display contamination will be removed from the site in suitable sealed containers for eventual disposal.

6.3 Emergency Medical Services

In the event of an employee injury or other medical emergency on-site, the Supervising Geologist and other personnel trained in first aid and CPR will immediately provide assistance. An MSA model self-contained breathing apparatus (SCBA) will be nearby for use by the Supervising Geologist and back-up geologist during emergency rescue situations requiring respiratory protection.

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